JULY, 1946

Railway Engineering and Maintenance

GIRDER STRENGTH IN A RAIL ANCHOR

The IMPROVED FAIR typifies bridge construction because of its girder strength insuring structural dependency and long life . . .

Canadian Nat. Rys

"Edgemark of Quality"

A TOUGH proving ground FOR RAILROAD FASTENINGS

Track bolt fastenings are put to the supreme test on mainline crossovers. Shocks, stresses and strains come from every direction under the pounding of heavy freight wheel loads and speedy passenger trains. Wear is severe; maintenance problems multiply.

Under such conditions Reliance Hy-Crome Spring Washer quality is proven. Reliance Crossing Hy-Crome Spring Washers, possess necessary reactive pressure to automatically compensate for developed looseness due to resultant wear and bolt stretch.

They're manufactured from the same high-quality special analysis steel and with the same care that has made Reliance Hy-Pressure Hy-Crome Spring Washers so popular for track joint use. They cut maintenance costs. Reliance Crossing Hy-Crome Spring Washers provide a wider bearing surface for the larger crossing nuts.

Like Reliance Hy-Pressure Hy-Crome Spring Washers, you can count on Reliance Crossing Hy-Crome Spring Washers to keep crossovers tighter longer.

An interesting folder of Reliance Hy-Crome Spring Washers for Track Applications is full of information you'll find helpful in selecting a type of Reliance Hy-Crome Spring Washer for every specific track problem.

EATON

EATON MANUFACTURING COMPANY

MASSILLON, OHIO *Reliance Division*

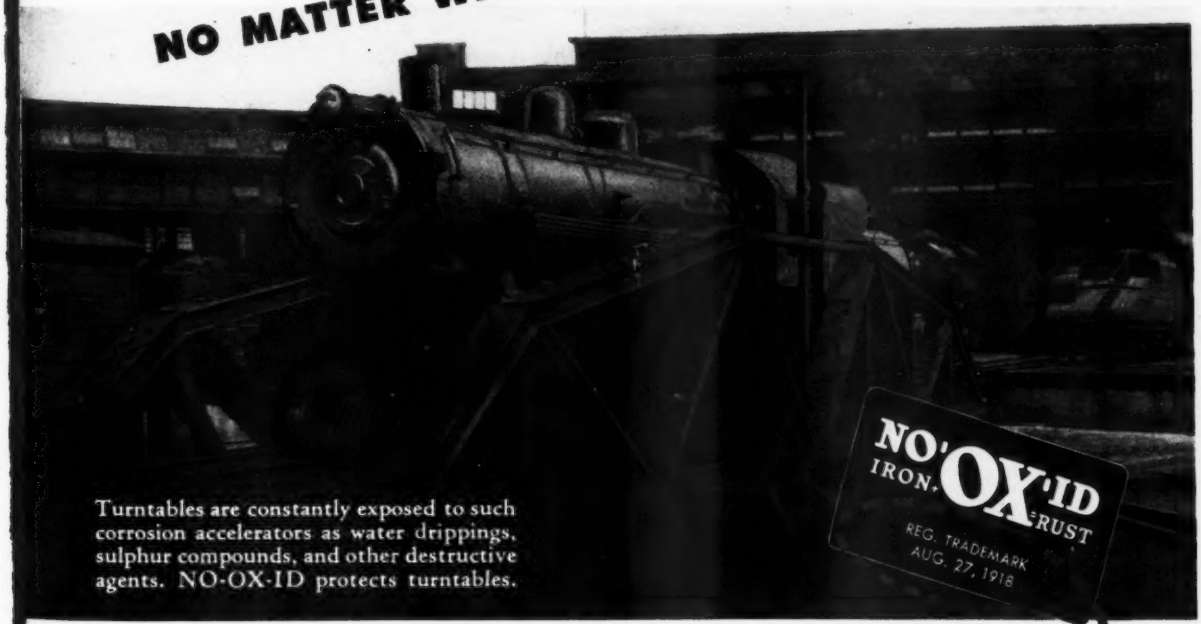
Sales Offices: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

Where it Rains, it Rusts...

The next time you see that first drop of rain, you can feel secure in the knowledge that you have safeguarded the large fortune you have invested in bridges and heavy equipment when they are protected with NO-OX-ID. You have taken no chances with rust that gnaws at steel causing loss of metal.

Today, NO-OX-ID is being sprayed and brushed on all types of railroad equipment... bridges, turntables, signal towers, water tanks, pipe. Metal equipment remains rust-free when you use NO-OX-ID. The tough, plastic NO-OX-ID coating mechanically excludes moisture and oxygen, and the chemical inhibitors penetrate to the parent metal to stop underfilm corrosion. NO-OX-ID can be applied over rusted surfaces without extensive precleaning. Prepare now to protect costly equipment against the rains that rust. Your near-by Dearborn Engineer is ready to help you solve this problem. Write for details.

NO MATTER WHICH WAY YOU TURN



Turntables are constantly exposed to such corrosion accelerators as water drippings, sulphur compounds, and other destructive agents. NO-OX-ID protects turntables.

The ORIGINAL RUST PREVENTIVE

Dearborn Chemical Company
Dept. U, 310 S. Michigan Ave., Chicago 4, Ill.
New York • Los Angeles • Toronto

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago 3, Ill. Subscription price: United States and Possessions, and Canada, $2.00; Foreign $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933, at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., post office. Address communications to 105 W. Adams St., Chicago 3, Ill.

Drive Spikes Straight and Faster with the NORDBERG SPIKE HAMMER

Two Nordberg Spike Hammers, two operators and four helpers will easily do the work of sixteen men driving spikes by hand.

The spike holder assures that all spikes are driven straight and vertical to the tie.

Here the spike is released from the holder by raising the holder handle. Release is accomplished during the continuous driving action.

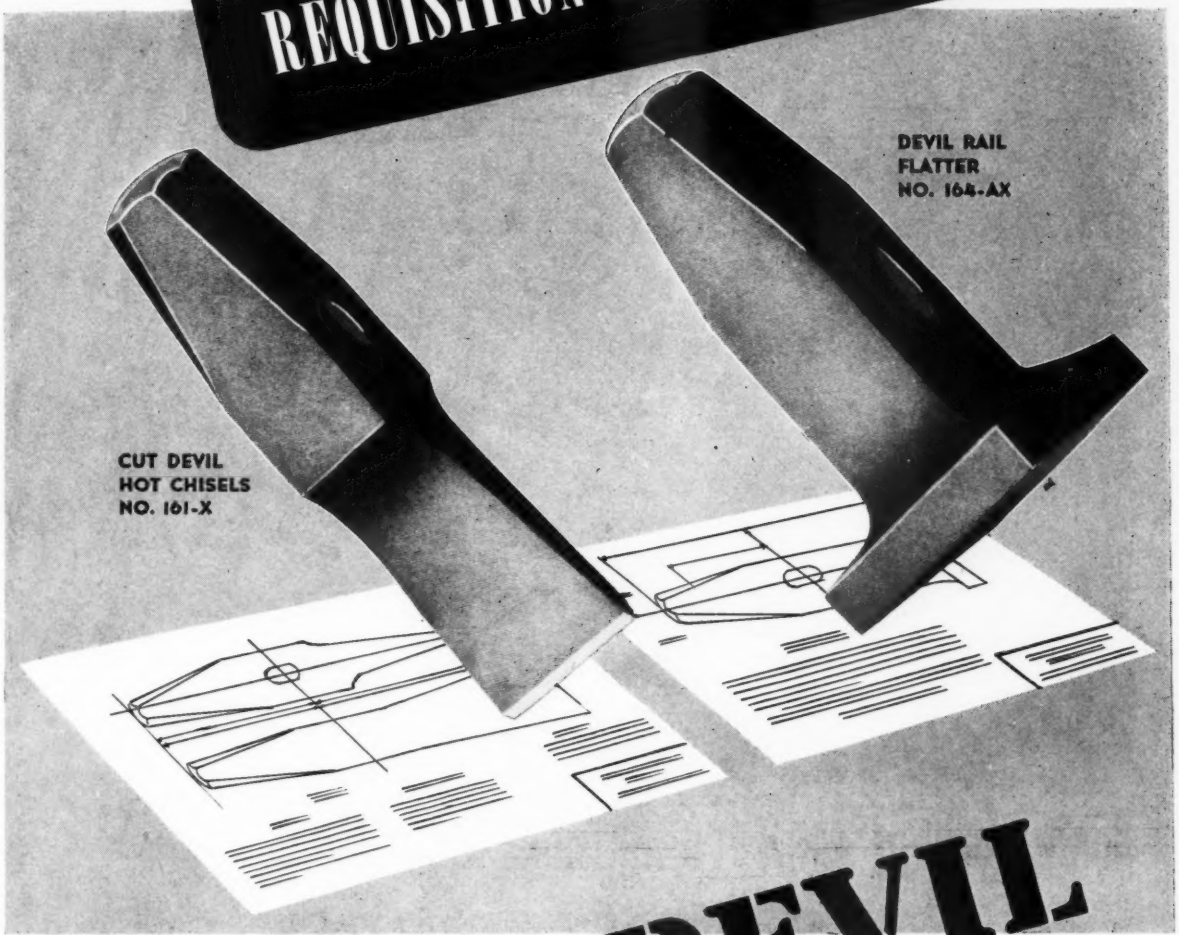
This recent addition to the line of Nordberg power driven track maintenance tools meets a long felt need for a machine that will drive spikes straight and do it faster and easier than any other method. With this machine every spike must be driven straight or not at all. This is accomplished by a spike holding device which keeps the spike straight and vertical to the tie until it is driven home. Every spike is also driven to a uniform proper depth, thus preventing over driving and damage to the rail base. An operator and two helpers will easily drive 800 spikes an hour . . . If your rail laying gangs are not equipped with Nordberg Spike Hammers, investigate the merits of this new Nordberg development.

NORDBERG MACHINERY

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

Export Representative—WONHAM Inc.—44 Whitehall St., New York

Where service is the toughest...
REQUISITION DEVIL TOOLS



DEVIL TOOLS

If you want a practical demonstration of heavy hand tool safety and economy, put some *Devil Rail Flatters* and *Cut Devil Hot Chisels* to work for you. These tools were definitely developed for rail welding gangs who subject them to the most severe service. *Keep a record of performance.* Then be prepared to recognize the extra values of Devil Tools made of selected, electric furnace alloy tool steel, and made under Warren's production control system.

WARREN DEVIL TOOLS

WARREN TOOL CORP.

General Sales Offices: 105 W. ADAMS ST., CHICAGO · *Factory:* GRISWOLD ST., WARREN, OHIO

18 years of Service...and Still Going strong! MONOTUBE Foundation Piles

IN 1928 the first tapered steel Monotube foundation piles were installed on one complete bent of a Wheeling and Lake Erie Railroad trestle bridge. Last month Union Metal engineers made a thorough inspection of that first Monotube piling job. They found it in excellent condition—*ready to serve for years to come*—and brought in the un-retouched photo at the top of this page to prove their point.

Today, job-wise engineers and contractors are using thousands of Monotubes for the construction of bridges, highways, underpasses and buildings.

Monotubes are light in weight, easy to handle, simple to install. They can be driven with average job equipment . . . extended easily on the job. They permit quick, thorough inspection because of their hollow, tubular construction.

For friendly cooperation, call on our engineers to help you with your planning. They'll show you why Monotube's low cost, easy handling and integrity make them preferred in foundation construction. Union Metal Manufacturing Co., Canton 5, Ohio.

UNION METAL

Monotube Foundation Piles

Reading Lines
Santa Fe
M-K-T Katy Lines
Proved
on the
NATION'S LEADING
RAILWAYS!
When you are considering crawler equipment for the solution of your maintenance-of-way problems, check into the equipment the leading railroads have been using —and are buying.
Such roads as the New York Central; Santa Fe; Chicago, Milwaukee & St. Paul; Union Pacific; Chicago & North Western; Pennsylvania; Illinois Central and others have used Northwests for years. They have found out what Northwest advantages and Northwest dependability mean.
Plan ahead to have proved equipment, equipment that has met the railway maintenance-of-way problem, equipment tested by the Nation's leading railways.
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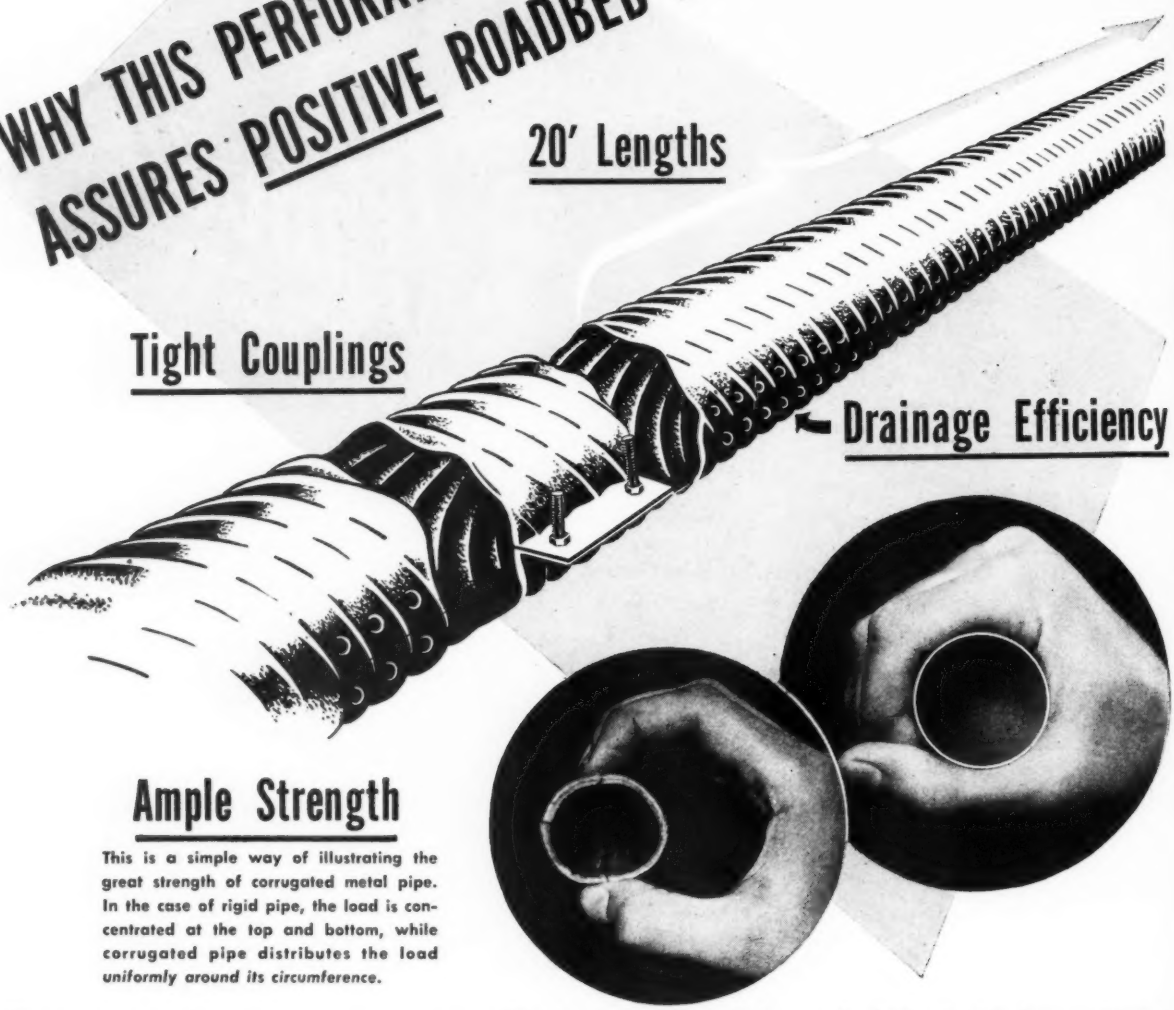
RAILWAY LINES
NEW YORK CENTRAL SYSTEM
YOU CAN MOVE YOUR NORTHWEST BY RAIL
ON ITS OWN TRAI
OR YOU CAN
NORTHWEST

WHY THIS PERFORATED ARMCO PIPE ASSURES POSITIVE ROADBED DRAINAGE

20′ Lengths

Tight Couplings

Drainage Efficiency



Ample Strength

This is a simple way of illustrating the great strength of corrugated metal pipe. In the case of rigid pipe, the load is concentrated at the top and bottom, while corrugated pipe distributes the load *uniformly around its circumference.*

These are four important reasons why ARMCO Perforated Pipe gives quick, positive drainage where ballast pockets prove troublesome.

Long lengths mean there is less chance for your subdrainage systems to get out of order because of localized soil-shifts. Strong, tight, bolted joints hold the 20′ sections *securely together.* Individual sections of pipe don't get out of line.

ARMCO Pipe is corrugated for high inherent strength. It also has the ability to deflect slightly under loads. This compresses the soil at the sides and tends to equalize the pressure around the entire pipe, thereby increasing its load-carrying capacity. The small, evenly spaced perforations in ARMCO Pipe admit the water freely but exclude the surrounding backfill.

Stabilized with ARMCO Perforated Pipe, your roadbeds need less maintenance. Costs go down. Speed restrictions are lifted. Ballast pockets are completely drained.

For complete information about ARMCO Perforated Pipe, write your nearest Armco Drainage & Metal Products, Inc. office—or the general offices of the company, 3525 Curtis Street, Middletown, Ohio.

ARMCO

Armco Drainage & Metal Products, Inc.

AT LOWER COST BY **AIRCOWELDING**

Their long experience in serving American railroads, enabled Airco engineers to develop the Aircowelding process for building up battered rail ends.

In this process, the rail surface is quickly heated to fusion temperature with the oxyacetylene flame and the added material is applied without puddling. With a little experience, a welder can flow the adding material so smoothly that a minimum of grinder or flatter work is required.

Using the fast-flowing Airco Railroad Rod, especially developed for use in Aircowelding, a tough wear-resisting deposit is produced that will outlast the original rail end.

For details of this improved process and other valuable maintenance-of-way suggestions, mail the coupon for your copy of the new 32 page illustrated book "Efficient Maintenance-of-Way Operations with the Oxyacetylene Flame and Arc Welding." You'll find it both interesting and helpful. Write: Air Reduction, 60 E. 42nd St., New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, Houston 1, Texas.

REM

AIR REDUCTION
60 E. 42nd Street
New York 17, N. Y.

Send a copy of "Efficient Maintenance-of-Way Operations with the Oxyacetylene Flame and Arc Welding" to

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AIRCO **AIR REDUCTION**
Offices in All Principal Cities

Costs Come Down Under the Airco Plan

CP Flanged Wheel Compressors
CP Tie Tampers

CP Self-Propelled, Two-Stage, Air-Cooled Compressors give from 15% to 35% more air per gallon of fuel, an economy possible through gradual speed regulator, varying speed gradually up and down exactly with air demand! Self-propelling drive is sturdy and reliable — there are no complicated gears or clutches. Unit consists of CP gasoline or Diesel-driven compressor, mounted on flanged wheel truck.

Self-propelled and non-self-propelled models of CP Compressors are available in sizes from 60 c.f.m. to 500 c.f.m. actual capacity.

To take full advantage of portable compressor capacities, use CP Tie Tampers — noted for their ease of handling as well as low air consumption. CP Tie Tampers are efficient in "nipping" and on small rises — also on jobs where the track is raised several inches.

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ELECTRIC TOOLS
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★★★★★★★★★
AIR COMPRESSORS
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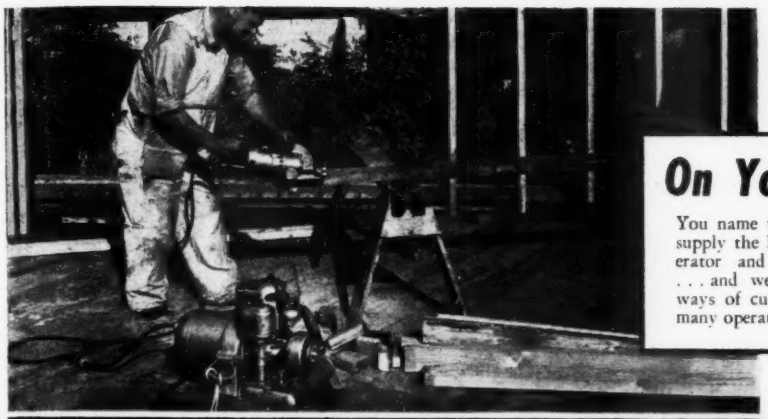
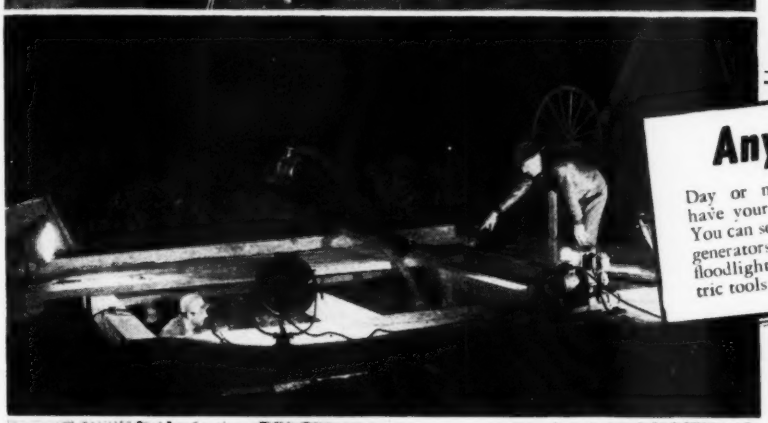
Step Right Up and Try Them Yourself



On Your Job

You name the job. We'll supply the Homelite Generator and power tools . . . and we'll show you ways of cutting costs on many operations.



Anytime

Day or night, you can have your demonstration. You can see how Homelite generators operate brilliant floodlights as well as electric tools.

Any Place

We'll go any place. We have representatives covering the entire country . . . men who will demonstrate all our equipment, our self-priming portable pumps, as well as our portable generators and blowers.

We want you to get the feel of Homelite Pump and Generator performance. We want you to see a Homelite Pump actually handling 15,000 gallons per hour . . . or lifting water 28 feet . . . or handling seepage or mud and solids without trouble.

Yes, and we want you to see a Homelite Generator operating floodlights, electric tools, radios, communications.

More than that, we want you to see how portable these gasoline-engine-driven units are and how easy they are to operate.

That is why we offer free demonstrations of Homelite Portable Pumps and Generators *on your job*, any time, any place. Write for a demonstration today.

Homelite

CORPORATION

Port Chester, New York

Portable Pumps Generators and Blowers

GASOLINE-ENGINE-DRIVEN

1,400 ft. long station platform of Illinois Central at Champaign, Ill., was constructed in two strips with dowel joint between. Concrete was finished with wood float to insure safe walking surface.

Concrete station platform of Alton Railroad at Springfield, Ill., built by modern paving methods and designed to withstand grinding action of steel-wheeled baggage trucks.

Railroads apply CONCRETE paving methods for low maintenance Station Platforms

MODERN highway paving practices, including the use in Northern States, of air-entraining portland cement concrete, are being applied to increase the life span and reduce the maintenance cost of railroad station platforms.

State highway department specifications for concrete paving practice relating to proportioning of concrete and methods of placing, finishing and curing, have been followed in some recent platform construction.

Air-entraining portland cement was used to produce concrete highly resistant to freezing and thawing and the action of salts used to remove snow and ice.

Latest data on construction of concrete station platforms designed to withstand hard service at *low annual cost* will be gladly furnished on request. Free in United States and Canada.

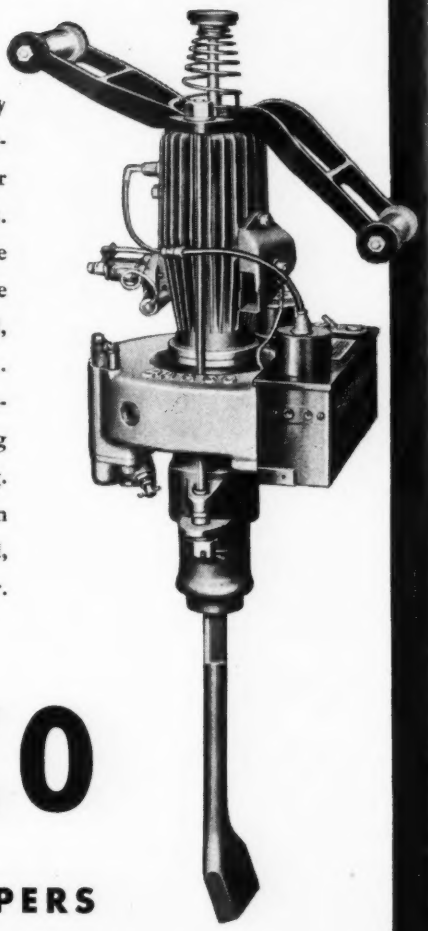
PORTLAND CEMENT ASSOCIATION

Dept. 7-27, 33 W. Grand Ave., Chicago 10, Ill.

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

TAMPS THE BALLAST

Fast and Firmly!



Harassed maintenance-of-way chiefs are putting Barco Ty-tampers in the hands of their hard-working labor forces. Foremen and workers alike are covering more trackage with this light, self-contained, easily-operated powerhouse... handling spot or gang tamping, cribbing, breaking, drilling —the toughest kind of going. Write for more information about this critically needed, economical, tireless worker.

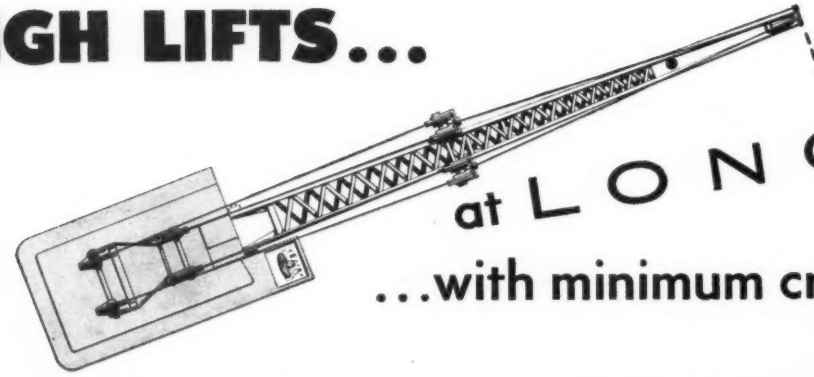
BARCO

UNIT TYTAMPERS

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERITY

BARCO MANUFACTURING CO., NOT INC. · 1805 Winnemac Avenue, Chicago 40, Illinois

HIGH LIFTS...

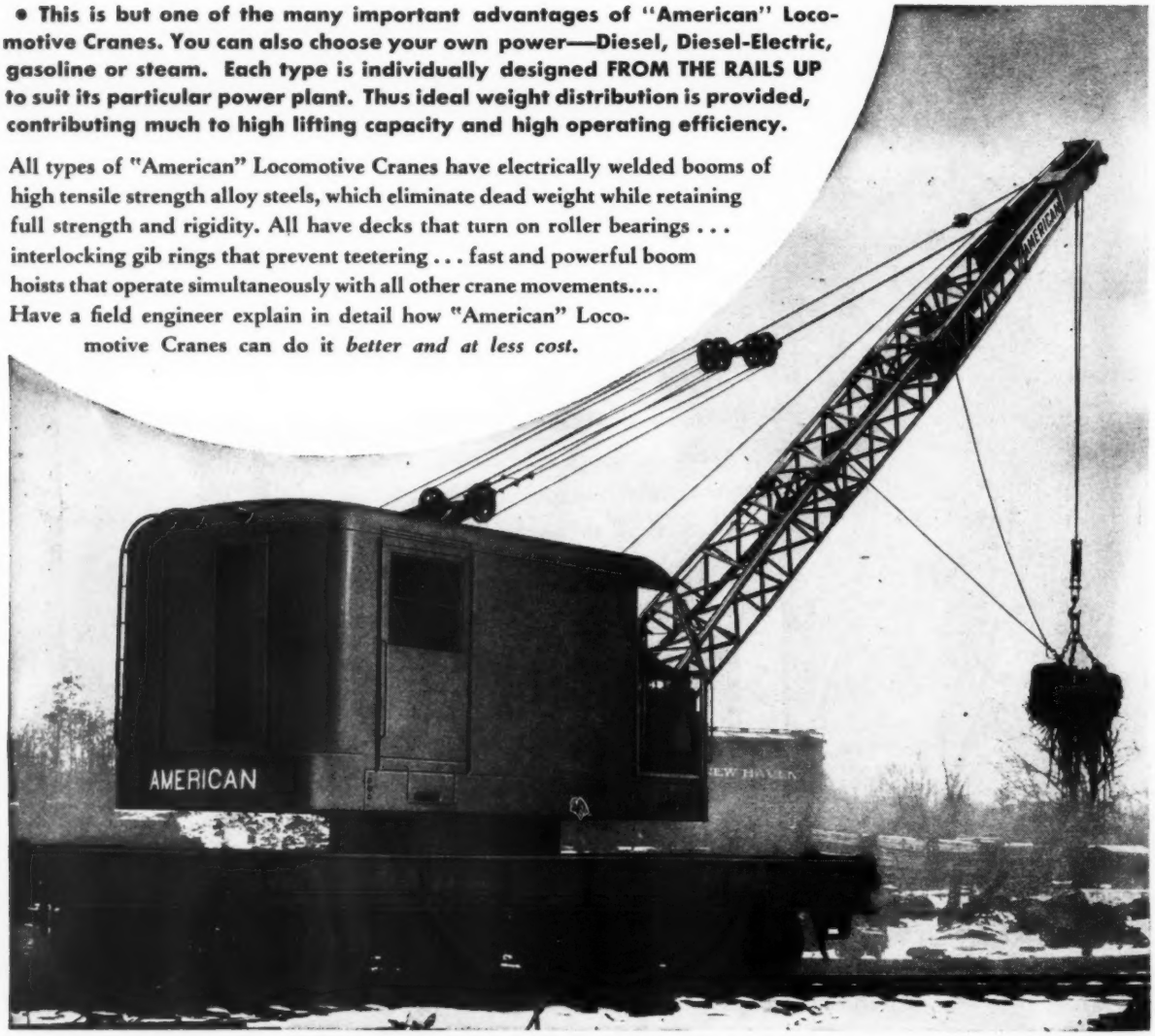


at LONG radii

...with minimum crane weight

• This is but one of the many important advantages of "American" Locomotive Cranes. You can also choose your own power—Diesel, Diesel-Electric, gasoline or steam. Each type is individually designed FROM THE RAILS UP to suit its particular power plant. Thus ideal weight distribution is provided, contributing much to high lifting capacity and high operating efficiency.

All types of "American" Locomotive Cranes have electrically welded booms of high tensile strength alloy steels, which eliminate dead weight while retaining full strength and rigidity. All have decks that turn on roller bearings . . . interlocking gib rings that prevent teetering . . . fast and powerful boom hoists that operate simultaneously with all other crane movements.... Have a field engineer explain in detail how "American" Locomotive Cranes can do it *better and at less cost.*



AMERICAN
HOIST & DERRICK CO.
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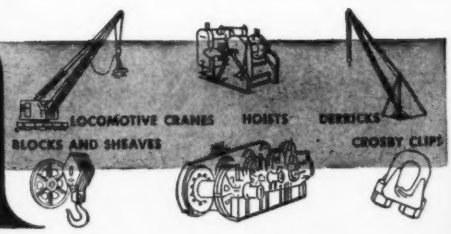


FAST TRACK FOR THE

Katy Komet

Clean, weed-free track is an important factor in helping to keep the Katy Komets, Katy Klippers, Katy Packers, Bullets, Rockets rolling on their fast freight schedules. To maintain this type of fine track, the Missouri-Kansas-Texas, along with more than 75 other major railroads, employs **WOOLERY WEED BURNERS** to help keep its right-of-way in good condition.

To facilitate weed elimination, at the lowest cost per track mile of operation, use **WOOLERY WEED BURNERS.**

We invite your investigation. Let us give you operating cost and performance data.

WOOLERY WEED BURNERS

Available in

5-BURNER
3-BURNER
2-BURNER
1-BURNER
models

WOOLERY MAINTENANCE EQUIPMENT

TIE-CUTTERS — WEED BURNERS — CREOSOTE SPRAYERS

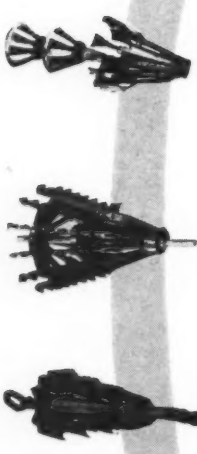
WOOLERY MACHINE COMPANY

MINNEAPOLIS — Pioneer Manufacturers of — MINNESOTA

RAILWAY MAINTENANCE EQUIPMENT

RAILWAY WEED BURNERS . MOTOR CARS . TIE CUTTERS . TIE SCORING

Locomotive Water Servicing

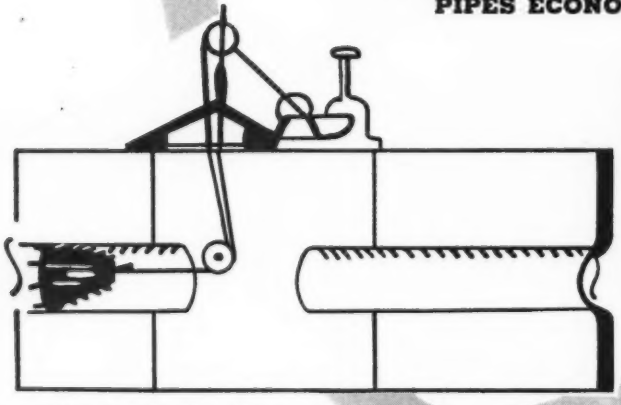


Today, when train schedules permit a maximum of 5 minutes for taking water, **CLEAN PIPES ARE ESSENTIAL.**

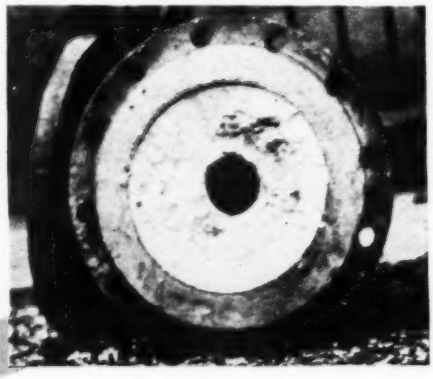
Complete cleaning of pipes of all kinds is a specialty with Pittsburgh Pipe Cleaner Company. For example, in one water crane cleaning job we increased water delivery from 877 gal. per min. to 2,500 gal. per min., and decreased the time for taking 10,000 gal. of water from 11½ min. to 4 min.—a reduction in time of over 250% for water servicing of locomotives.

Pittsburgh's engineers thoroughly clean all pipes, including those with even the hardest incrustations. For water cranes such cleaning includes the risers, suction pipes, water column, water line, and supply line. This thorough cleaning insures fast delivery of water to locomotives, reduction of pumping pressures, minimizing of pumping costs, and eliminating the necessity for laying new water mains.

YOU CAN SAVE YOUR RAILROAD TIME AND MONEY BY HAVING PITTSBURGH'S ENGINEERS COMPLETELY CLEAN YOUR WATER CRANE PIPES ECONOMICALLY, SPEEDILY!



A cross section view showing Pittsburgh's method for mechanical cleaning of pipes and sewers.



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Pittsburgh

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PITTSBURGH, BOSTON, NEW YORK, PHILADELPHIA, BALTIMORE,

Time REDUCED 250%

Send for information about our complete contract pipe and sewer cleaning services.

PIPE CLEANER COMPANY

PITTSBURGH 6, PENNSYLVANIA

WASHINGTON, BUFFALO, DETROIT, CHICAGO, CINCINNATI, ST. LOUIS

COMPRESSION
Rail Anchors

MEAN economical track—less respacing and resurfacing of ties—reduction in joint wear—uniform expansion at rail ends. *Two-way* protection prevents rail creepage on main line traffic, turnouts, bridges and crossings.

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1 man bends 152-lb. rail... cold!
The BUDA Model 130 Rail Bender is distinctly different in design — simple in construction — easy to attach and operate.

with the BUDA RAIL BENDER

Heavy stock and guard rail bends are easily made in the field by one man using a BUDA Rail Bender. The Model No. 130 consists of a steel hook and 25 or 35 ton special journal jack. The jack has a specially shaped cap that takes a cylindrical bearing in the end of the hook for freedom of movement. The base of the jack is deeply slotted and flanged to secure its hold on the rail. A jack ram scale permits accurate duplication of bends. Send today for descriptive bulletins.

BUDA Model 2215-SB Automatic Lowering "All-Purpose" Jack.
BUDA Model 715 Track Jack. 15 Tons Capacity.
BUDA Power Track Drills for faster drilling at low cost.
BUDA Track Liners are labor savers.

wherever there are railroads there is

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HARVEY (Chicago Suburb) **ILLINOIS**

paint -GOES ON FASTER -BONDS TIGHTER -LASTS LONGER

WHEN SURFACES ARE CLEANED FIRST BY

OXY-ACETYLENE FLAMES

THREE STEPS FOR BEST RESULTS:

1 Flame-Cleaning — loosens scale, drives out moisture.

2 Wire-Brushing — removes loose material.

3 Painting — spreads easily on the warm, dry surface.

Ask an Oxweld representative for complete information.

THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation
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OXWELD
RAILROAD SERVICE

SINCE 1912—THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

LET'S "TALK TORQUE"

about Faster Driving of Nuts, Bolts and Cap Screws

NEW *Thor* **⅜" PNEUMATIC**

IMPACT WRENCH

READY FOR IMMEDIATE DELIVERY

GREATER TORQUE ACTION—with no torque *reaction* to fatigue the operator—is the big feature of this power-packed, easy-handling Thor *reversible* Impact Wrench. It drives and removes nuts, bolts and cap screws faster because a new and more efficient *direct impact* mechanism and *short spindle* provide maximum striking power. No matter how tightly fasteners are to be driven, or how firmly they may be set, this amazing tool has the power and torque to handle the toughest jobs.

In addition, it's smaller, lighter and more compact—*it weighs only 3¾ pounds*—but it's sturdier and longer wearing. Simplified design reduces wear and insures smoother operation. You'll find it ideal for fast, low-cost production. *Try it*—ask your nearest Thor representative for a demonstration.

Model No. 6
GRIP THROTTLE
Only 5 7/16" long—⅜" capacity.

LEVER THROTTLE
Furnished in place of grip throttle, if specified. No extra charge. Ideal for vertical suspension work.

¼, ⅝, ¾ and 1¼" capacities will soon be available.

INDEPENDENT PNEUMATIC TOOL COMPANY
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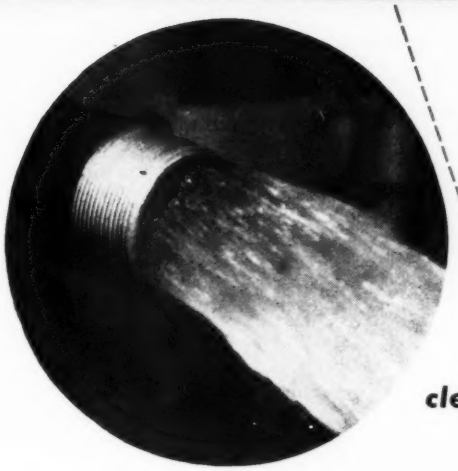
Thor **PORTABLE POWER TOOLS**

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

DOWELL



for more water-faster!

clean your water lines—the chemical way

The Dowell method of chemically dissolving accumulated scale is the modern, rapid method of cleaning important water lines . . . under ground, above ground—indoors or out! Leading railroads, utilities and other industries have found it practical, reliable and economical.

Dowell specialists do the entire job—in a few hours. They chemically analyze samples of deposits taken from *your* lines, select the proper solvents—and bring with them all equipment needed to perform the thorough cleaning treatment.

Call the nearest Dowell office for a free estimate. Ask for your copy of "More Power to America's Industry"—new color booklet which describes the Dowell Chemical Service in more detail.

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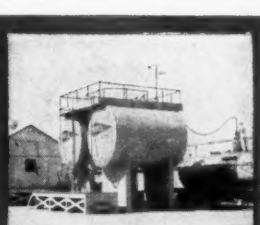
SPECIALISTS IN CHEMICAL CLEANING SERVICE

Dowell's experienced industrial engineers are backed by the complete research and

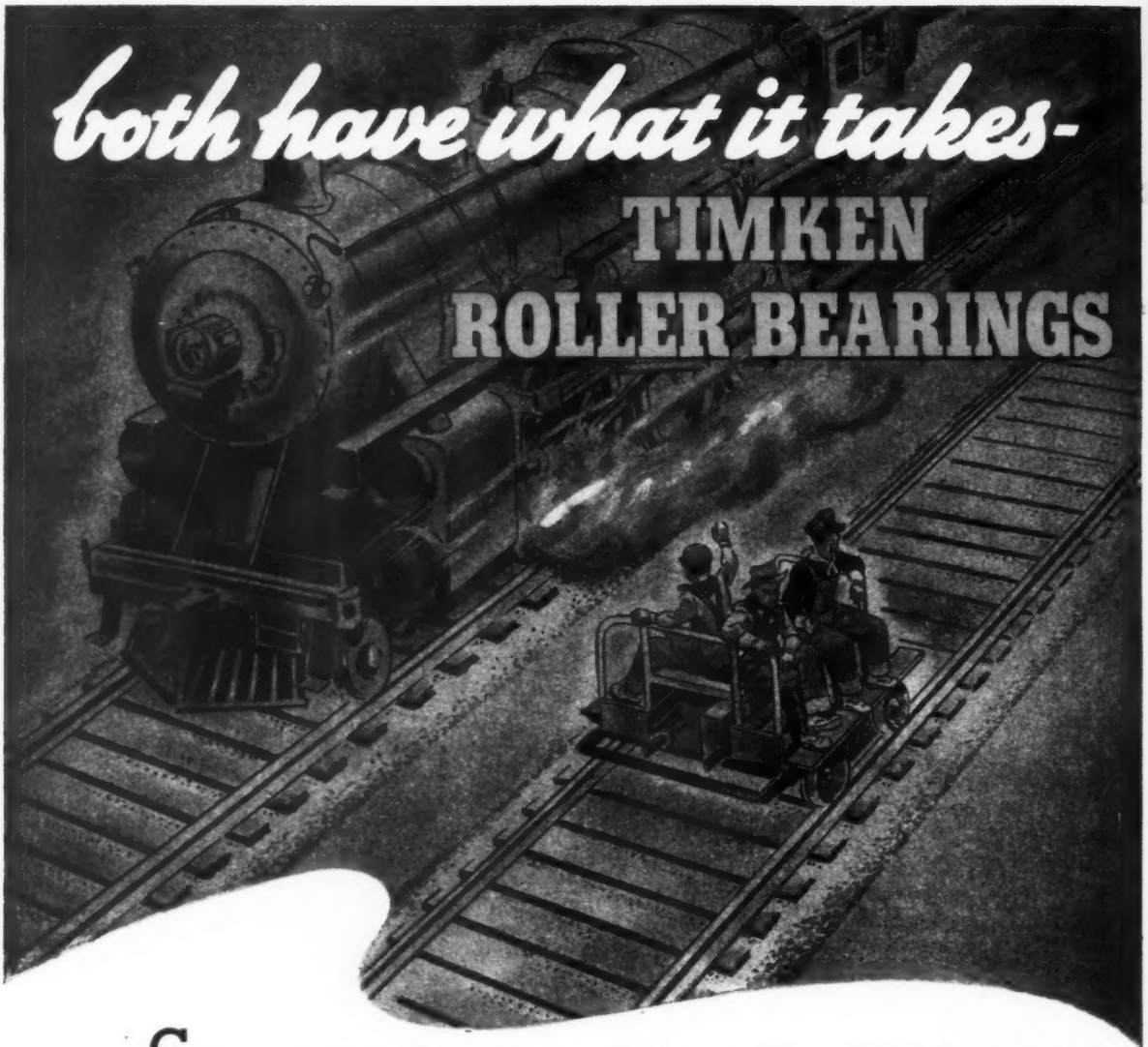
Dowell's equipment is modern and complete—scientifically designed. Treating



Dowell cleaning solutions are "tailor-made" to fit each job. All ingredients are of

DOWELL

FOR INDUSTRIAL CHEMICAL SERVICE



Constant readiness for service; ability to stay on the job for maximum periods without shopping; minimum attention for lubrication and maintenance; all these advantages are common to equipment using Timken Bearings —main line or auxiliary.

Your road probably has them in locomotives, passenger cars and streamlined trains; you should have them in your new section motor cars and trailers; you'll find them in leading makes. Ask this question before buying: "Are they Timken Bearing Equipped"? And make sure the trade-mark "TIMKEN" is stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

Specify DEPENDABLE

NORTHWESTERN

RAILWAY TRACK MOTOR CARS AND MAINTENANCE OF WAY EQUIPMENT

TYPE NO.	MODEL AND SERVICE
561 IHC 85	NORTHWESTERN 561-IHC 85 HEAVY DUTY EXTRA GANG CAR INTERNATIONAL 6 CYL. MOTOR, 85 H. P. — 8 TO 200 MEN.
581 85	NORTHWESTERN 581 85 POWER BALLAST DISCERS INTERNATIONAL 6 CYL. MOTOR, 85 H. P.
566 W	NORTHWESTERN 566 W — B & B GANG CAR WAUKESHA FC 4 CYL. ENGINE, 36 H. P. — 8 TO 100 MEN.
514	NORTHWESTERN 514 ALL SERVICE SECTION CAR NORTHWESTERN 8-13 H. P. ENGINE — 8 MEN.
534	NORTHWESTERN 534 LIGHT SERVICE SECTION CAR BRIGGS & STRATTON AIR COOLED ENGINE, 6.4 H. P. — 6 MEN.
532	NORTHWESTERN 532 LIGHT ALL SERVICE CAR BRIGGS & STRATTON AIR COOLED ENGINE, 6.4 H. P. — 4 MEN.
535	NORTHWESTERN 535 ONE MAN INSPECTION CAR BRIGGS & STRATTON AIR COOLED ENGINE, 6.4 H. P. — 1 OR 2 MEN.
538	NORTHWESTERN 538 ONE MAN INSPECTION CAR BRIGGS & STRATTON AIR COOLED ENGINE, 6.4 H. P. — 1 OR 2 MEN.
540DA	NORTHWESTERN 540 DA RAIL AND FROG GRINDER DOUBLE HEAD TYPE, WIS. 4-CYL. AIR COOLED ENGINE, 22 H. P.
544	NORTHWESTERN 544 SELECTIVE RAIL JOINTER SLOTTER RAIL JOINT SLOTTER & BEVELER — B & S AIR COOLED ENGINE, 6.4 H. P.
519	NORTHWESTERN 519 BALLAST CAR ALL STEEL CONSTRUCTION — 16 CU. FT. CAPACITY.
500A	NORTHWESTERN 500 A WORK CAR STANDARD WORK CAR — 6000 LBS. CAPACITY.
500A12	NORTHWESTERN 500 A 12 HEAVY DUTY WORK CAR HEAVY DUTY WORK CAR — 10,000 LBS. CAPACITY.
562AD	NORTHWESTERN 562 AD WORK CAR AND GANG TRAILER HEAVY DUTY STEEL FRAME TRAILER — 10,000 LBS. CAPACITY — 24 MEN.
504	NORTHWESTERN 504 LIGHT WEIGHT MOTOR CAR TRAILER FOR TELEGRAPH CREWS — WEIGHT 350 LBS. — CAPACITY 1000 LBS.
ENGINES	NORTHWESTERN SECTION MOTOR CAR ENGINES REPLACEMENT ENGINES — 8-13 H. P. WATER COOLED.
EQUIPMENT	REPLACEMENT WHEELS, AXLES AND BEARINGS FOR MOTOR CARS, PUSH CARS AND TRAILERS.

NORTHWESTERN REPRESENTATIVES

CHICAGO 5, ILL.
OTIS B. DUNCAN
37 W. Van Buren St.

NEW YORK 7, N. Y.
WALTER H. ALLEN
Room 107-E, 30 Church St.

BOSTON, MASS.
WM. B. JOYCE
P. O. Box 154
Beverly, Mass.

WASHINGTON 6, D. C.
W. NEWTON JEFFRESS
1731 K Street, N. W.

ST. LOUIS 3, MO.
WILLIAM J. ROEHL, INC.
1218 Olive Street

CLEVELAND 15, OHIO
C. E. MURPHY
923 Midland Bldg.

ST. PAUL 1, MINN.
GEORGE G. PREST
E-808 First Nat'l Bank Bldg.

OMAHA 2, NEB.
F. J. McDONOUGH
Cardinal Supply & Mfg. Co.
427 Sunderland Bldg.

NEW ORLEANS 12, LA.
W. J. CHURCH
308 Carondelet Bldg.

PITTSBURGH 19, PENNA.
J. A. EGBERT
Railway Products Co.
3605 Gulf Bldg.

SAN FRANCISCO 5, CALIF.
GEO. L. EDMONDSON
681 Market St.,
1036 Monadnock Bldg.

DENVER 2, COLO.
MILTON W. ALLEN
728 U. S. Nat'l Bank Bldg.

LOUISVILLE 6, KY.
M. M. DILLEY
Power Gates Company
116 S. Campbell St.

ATLANTA 2, GA.
SOUTHERN IRON & EQUIPMENT CO.
P. O. Box 2029

BIRMINGHAM 3, ALA.
H. G. MOUAT
544 Martin Bldg.

PORTLAND 4, ORE.
HARMER STEEL PROD. & SUPPLY CO.
138 S. W. First Ave.

EXPORT AGENTS

NEW YORK 6, N. Y.
O. PHILIPP & COMPANY, INC.
19 Rector St.

WRITE FOR COMPLETE CATALOG CONTAINING PRICES AND SPECIFICATIONS ON NORTHWESTERN RAILWAY TRACK MOTOR CARS AND MAINTENANCE EQUIPMENT

NORTHWESTERN MOTOR COMPANY, EAU CLAIRE, WIS., U. S. A.

SEALTITE HOOK BOLT

1. The design of the Sealtite Fins establishes a positive resistance to [illegible] as compared to a square neck bolt, thereby reducing maintenance.

2. The Sealtite Fins cut cleanly into the wood, seating firmly with a [illegible]num of side pressure.

3. Easier driving reduces the labor cost of application.

4. Sealtite Hook Bolts can be driven in a hole of the same diameter as the bolt without splitting the wood. Close fit of bolt in hole eliminates air pocket and retards corrosion. . . . Makes a tighter installation.

5. Sealtite Washer Nut prevents seepage of water, thus protecting the timbers against rotting. A nail hole in Washer Nut head provides for positive lock against nut loosening.

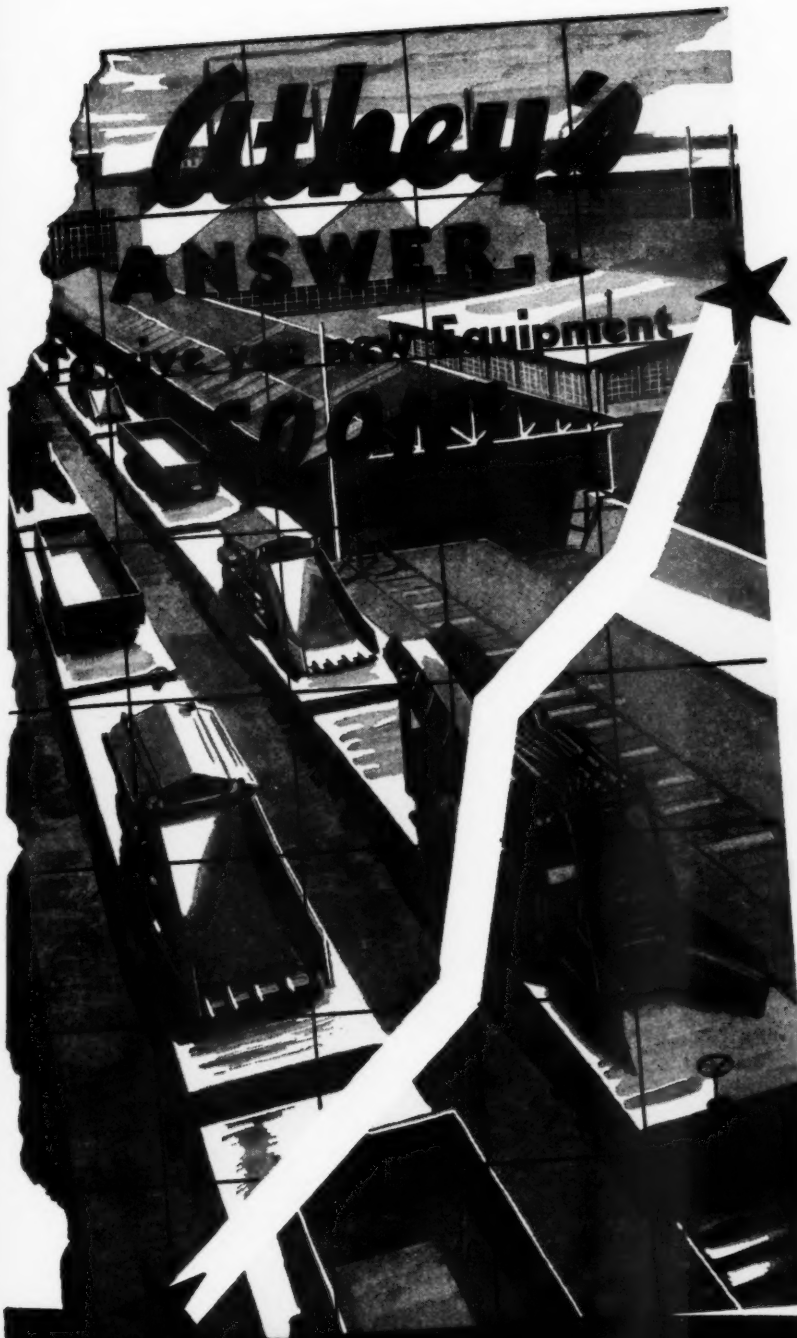
6. Design of the Hook Bolt head develops full strength of bolt without distortion of the hook. Angle is reinforced sufficiently to prevent hook from straightening when bolt is tightened or subjected to stress.

7. The hook can be furnished with angle made to conform to slope of the underside of the beam flange.

Double Life **SEALTITE HOOK BOLTS**—Because railroad trestles and bridges are constantly exposed to corrosive conditions we recommend the economy of ordering your hook bolts in the Sealtite Double-Life Hot-Dip galvanized finish sealing the bolt in zinc which retards all corrosion and saves expense of frequent replacement.

LEWIS BOLT & NUT COMPANY
504 Malcolm Avenue S.E. · Minneapolis, Minnesota

A *Greatly Improved* FASTENER



INCREASE IN PRODUCTION OF *Athey* PRODUCTS...

Athey wants everyone to know what is being done at the factory to speed delivery of new Mobi-Loaders, Force-Feed Loaders, and Forged-Trak Trailers. Here are the facts . . .

. . . quarter of a million dollars recently invested in new machinery for faster output at highest quality.

. . . expansion and revision of assembly lines for greater efficiency and increased production.

. . . all departments operating at full capacity, manned by highest skilled workmen.

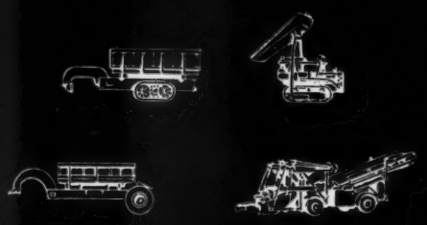
. . . a production rate today substantially greater than that of prewar level.

That's "Athey's Answer" . . . and the reason you will receive your urgently-needed machines sooner than you expected!

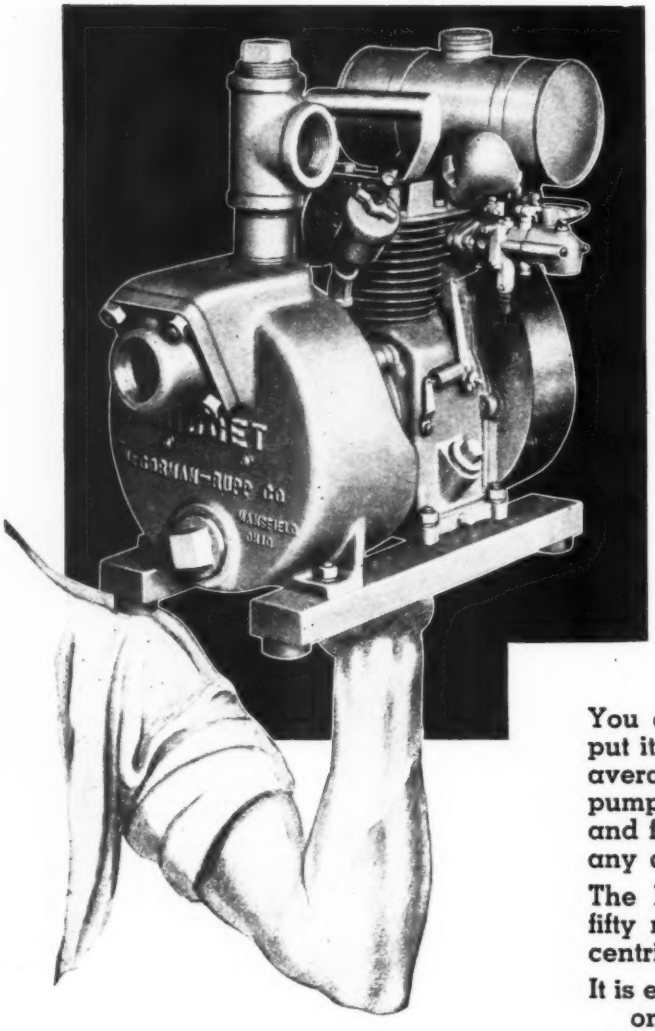
ATHEY PRODUCTS CORPORATION
Chicago 38, Illinois

Athey APCOR Products

Athey



DEPENDABLE HAULING AND LOADING EQUIPMENT



A MIDGET *in size* *A* GIANT *for work*

You can lift it with one hand -- you can put it on the toughest job you can find. At average heads the Gorman-Rupp "Midget" pump will handle 3000 gallons per hour and for longer time and less attention than any comparable pump.

The Midget is the smallest of more than fifty models of Gorman-Rupp, self-priming, centrifugal pumps.

It is easily carried from job to job -- weighs only 60 pounds.

It is automatic self-priming -- when the engine starts the water starts.

It is non-clogging -- will handle any muck or solids that will pass the intake strainer.

It is economical -- pumps more per pound of pump than any other pump on the market.

Other models will handle capacities up to 125,000 gallons per hour. There is a size of Gorman-Rupp self-priming centrifugal pump to meet any pumping requirement. Our nearest distributors will send you one and let you be the judge. If it doesn't do a better job than any pump you have seen, return it at our expense.

Write for further information.

FOUR of more than 50 models of Gorman-Rupp Pumps

Capacity in Gals. Per Hour with pump 15 ft. above water

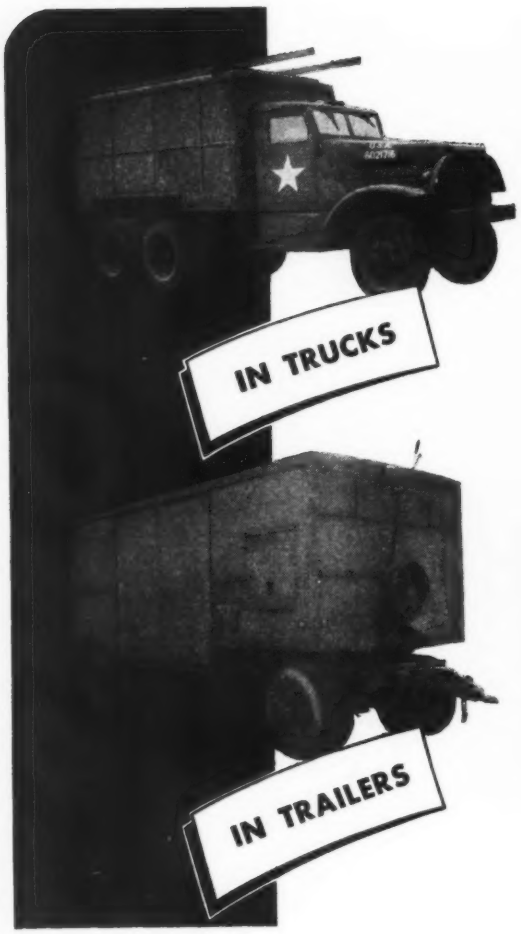
Total Head	Midget (60 lbs.)	Eagle (120 lbs.)	40-M (1080 lbs.)	90-M (1600 lbs.)
25	3960	11220		
30	3840	10200	34500	76800
40	3720	8400	33900	73800
50	3300	6900	32700	69600
60	2280	5100	30600	63000

THE GORMAN-RUPP COMPANY

GORMAN-RUPP PUMPS — UNSURPASSED FOR PUMPING FAST

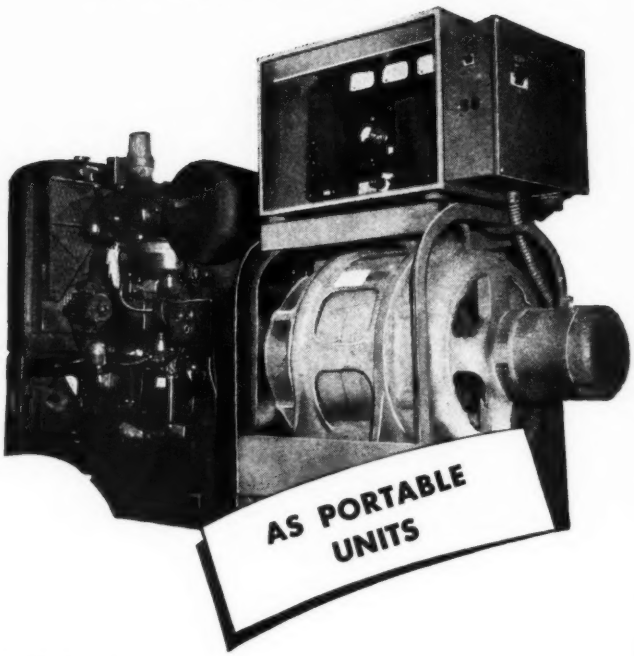
332 N. BOWMAN STREET • MANSFIELD, OHIO

FIRST
CHOICE
OF RAILROAD MEN
EVERYWHERE
DUFF·NORTON
TRACK JACKS
No 117
DUFF-NORTON
15 TONS
• There is a specific type of safe, easy operating Duff-Norton Track Jack for every track job: Single-Acting Jacks for section gang work; Double-Acting Jacks for extra gang work; Combination Trip and Automatic Lowering Jacks; Side-Lift Jacks; Surfacing and Lining Jacks; Tie Spacers. —Every one is safe, husky and easy to operate. It will pay you to specify Duff-Norton Track Jacks as your standard equipment.
DUFF-NORTON JACKS
DUFF-NORTON TRACK JACKS
ARE DESIGNED, ENGINEERED
AND TESTED TO GIVE YOU LONGER,
MORE EFFICIENT SERVICE
THE DUFF-NORTON MANUFACTURING CO.
PITTSBURGH, PA.



ELECTRIC POWER UNITS

—Mobile and Portable



The War Assets Administration has priced for *immediate sale* 25 KVA gasoline-powered AC Generators—120 volts, single phase, 60 cycles—

- in trucks
- in trailers
- as portable units

The mobile equipment is used but in good condition. Many separate units are unused, some are used but all are in good condition. They should be of particular interest to construction contractors and all users of electric power in the field.

Write or phone your nearest War Assets Administration Regional Office for full information.

- **IN TRUCKS $5487 or less***
- **IN TRAILERS 3017 or less***
- **PORTABLE 1987 or less***

*(*depending on condition)*

F.O.B. Baltimore, Md. San Francisco, Cal. or Cleveland, O.

Trucks and Trailers in Baltimore only.

WAR ASSETS ADMINISTRATION

OFFICES LISTED BELOW ARE TEMPORARILY IN RECONSTRUCTION FINANCE CORPORATION AGENCIES

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cleveland • Dallas • Denver Detroit • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville Minneapolis • Nashville • New Orleans • New York • Oklahoma City • Omaha • Philadelphia Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane Cincinnati • Fort Worth (Telephone 3-5381)

529

SEE FAIRBANKS-MORSE FIRST FOR MOTOR CARS

What are your primary motor car requirements? Power? Safety? Portability?

If the features you want built into a motor car are stamina, safety, and light weight, then check with Fairbanks-Morse Motor Cars. You will agree they will give you the service you are looking for.

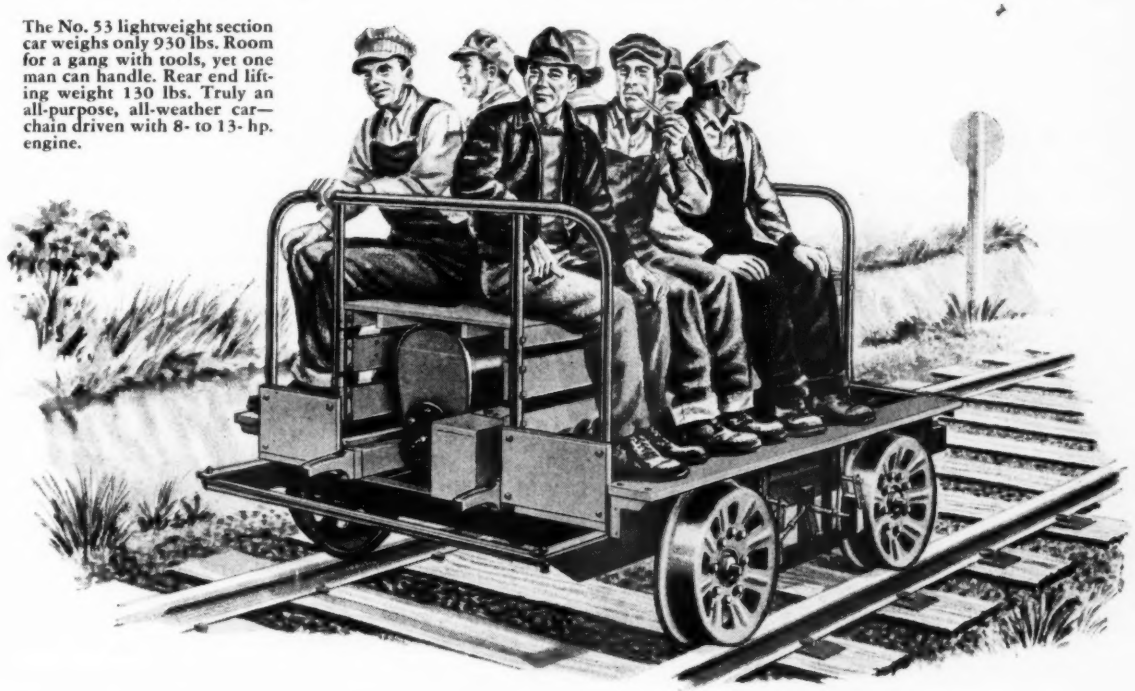
Here is needed power for grades and curves ... rugged construction for maximum safety at straightaway speeds ... light weight for easy handling.

Moreover, here are proved dependability and economy of operation that mean savings in maintenance time and dollars.

Signal maintainers, section or bridge gangs, track inspectors, roadmasters, etc., have used Fairbanks-Morse Motor Cars for over 50 years. Profit by their experience and make your motor car investment count... specify Fairbanks-Morse!

Fairbanks, Morse & Co., Fairbanks-Morse Bldg., Chicago 5, Illinois.

The No. 53 lightweight section car weighs only 930 lbs. Room for a gang with tools, yet one man can handle. Rear end lifting weight 130 lbs. Truly an all-purpose, all-weather car—chain driven with 8- to 13- hp. engine.



Fairbanks-Morse

A name worth remembering

Diesel Locomotives • Diesel Engines
Scales • Motors • Pumps • Generators
Magnetos • Stokers • Railroad Motor Cars and Standpipes • Farm Equipment

VIBRATORY ACTION and QUICKLY INTERCHANGEABLE BLADES MAKE

JACKSON VIBRATORY Tampers

PEAK PERFORMERS under ALL CONDITIONS

THAT smoother, firmer, longer-lasting tie beds are obtained with JACKSON Vibratory Tie Tampers, is a fact that JACKSON field engineers are always happy to demonstrate. But that's only half the story of why quality of track goes up while cost of maintenance goes down wherever JACKSON equipment is used. The unique vibratory action of JACKSON Tampers does the work faster as well as better. And, because they are available with five quickly interchangeable blades, specifically designed to meet every condition, JACKSON Tampers perform at peak efficiency in ALL BALLASTS, in ALL LIFTS and in every surfacing or tamping operation in which tampers may be used, including "Spotting," "Cribbing-out," etc.

Conclusive proof of these claims is clearly evident in the fact that more than 4 out of 5 of the leading roads have standardized on JACKSON equipment. Which suggests that if you are not already a user, you investigate this time and money-saving equipment at once. We will gladly send you complete information or arrange for a demonstration. Write, NOW.

U-607
Does a job that no other tool will do in crushed granite, trap rock, or slag. Prevents locking up before compaction completed.

1-2A
(left and right)
Most universally used for all operations in gravel, slag or 1½" to 2" stone, including "Spotting." Point acts as pick for opening hole beneath tie.

U-606
Tip is 6" wide. Not a spotting blade, except in light ballasts, but very efficient in all ballasts from cinders to 2" rock, depending on lift.

U-600
Known as the "crammer." Amazingly fast in placing gravel and lighter ballasts in 2" to 8" or 10" lifts; also efficient in crushed material of small to medium size where lift is moderate to high.

U-609
For removing badly cemented ballast in tie renewal or skeletonizing operations, removing ice around the track or grading work in frozen ground this blade really does a job.

ELECTRIC TAMPER & EQUIPMENT CO., Ludington, Michigan

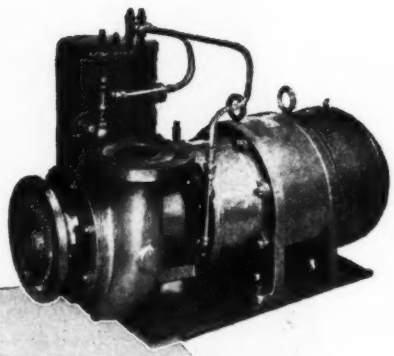
END CORROSION WITH R.M.C. PACKING

Protection from corrosion is permanent with RMC Rail Joint Packing because the packing is sealed-in for the life of the joint. It eliminates rusting of the bolts and nuts and reduces "freezing" of the joint, thus permitting essential expansion and contraction of the rail. Your rail maintenance problem is simplified by use of RMC Rail Joint Packing. Write today for complete information.

RAILWAY MAINTENANCE CORP.
PITTSBURGH 30, PENNSYLVANIA

BJ *Type* TLB *Bulk Station Pump*

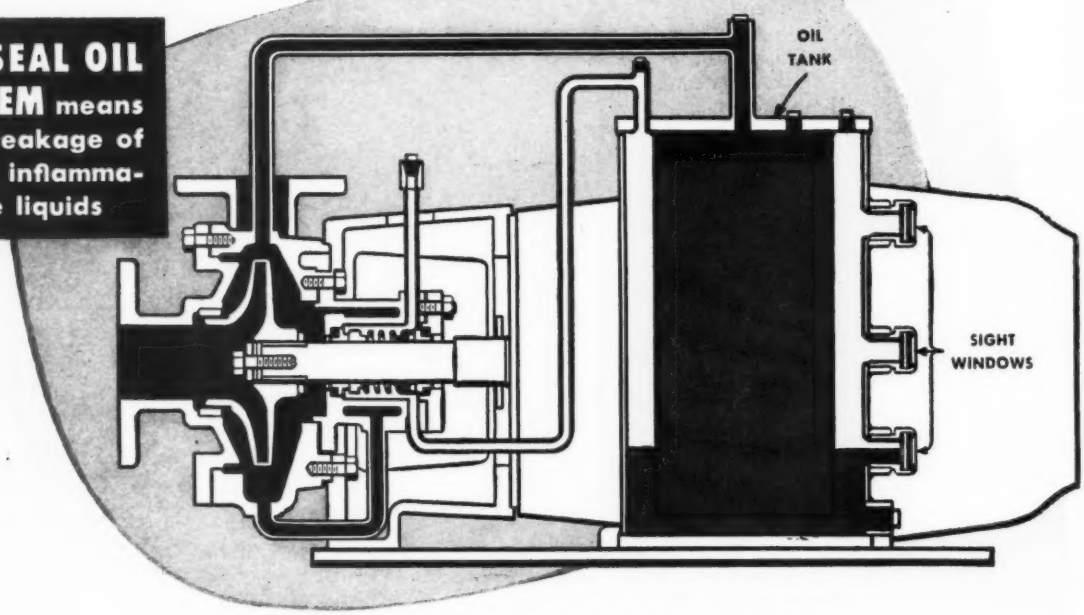
A centrifugal pump designed especially for pumping gasoline, butane, propane, kerosene, stove oil, lubricating oils, diesel fuel, paint thinner and other hydrocarbons.



The TLB is a single suction, single stage centrifugal pump of the BJ Bilton type (pump close-coupled to an induction motor with a single shaft common to both).

A double mechanical seal, contained in an oil-filled, liquid-cooled seal chamber, replaces the conventional stuffingbox. And a special two-compartment oil tank connects pump discharge to seal chamber in such a way that seal chamber is filled with oil at discharge pressure but the oil is isolated from pumped liquid. Original filling of oil will last a year or more.

The SEAL OIL SYSTEM means —no leakage of costly inflammable liquids



PUMPED LIQUID

ISOLATING LIQUID (usually water)

OIL

THE UNIQUE SEAL ARRANGEMENT HAS SEVERAL ADVANTAGES

The success of the double mechanical seal and the seal oil system lies in the fact that oil pressure in seal chamber is always slightly higher than pressure at entrance to inner seal . . . because of the pumping action of impeller shroud and hub.

1. **NO LEAKAGE of costly, inflammable liquids through seal chamber.**
2. **GOOD LUBRICATION of ground seal faces is maintained by leakage of lubricating oil from seal chamber even though pump loses suction. This leakage is so minute that no trace can be found in the pumped liquid.**
3. **NO CORROSION of seal parts regardless of liquid pumped.**

Byron Jackson Co.

LOS ANGELES 54, CALIFORNIA

Offices in Principal Cities

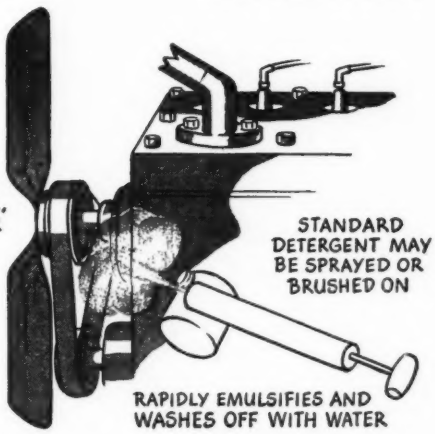
STANDARD ENGINEERS NOTEBOOK

CALOL

RPM

STANDARD DETERGENT HAS HIGH SOLVENT POWER, QUICKLY DISSOLVES GREASE

USED FOR CLEANING ENGINES, CHASSIS, AUTO BODIES, SHOP FLOORS, RAMPS, BENCHES, PARTS


NON-CORROSIVE, WILL NOT HARM METAL, LACQUER OR PAINT
STANDARD DETERGENT MAY BE SPRAYED OR BRUSHED ON
RAPIDLY EMULSIFIES AND WASHES OFF WITH WATER

Non-corrosive detergent makes cleaning easier

Because Standard Detergent will not harm metal, lacquer or paint, it can be used safely on truck and bus bodies, engines, chassis, etc., to dissolve thoroughly grease and grime. After the dirt is loosened, both detergent and dirt easily flush off with either cold or warm water.

Since Standard Detergent evaporates very slowly and does not lose its solvent power, it may be used repeatedly to wash parts. Remove the dirt that settles out and the remaining detergent is still as effective as ever.

Standard Detergent is non-explosive at room temperature, assuring a high degree of safety in cleaning floors, ramps, benches and tank-truck compartments that have contained oil.

Standard Detergent can be applied by spraying, brushing or dipping. Its quick action, long life and low initial cost save time and money for many operators.

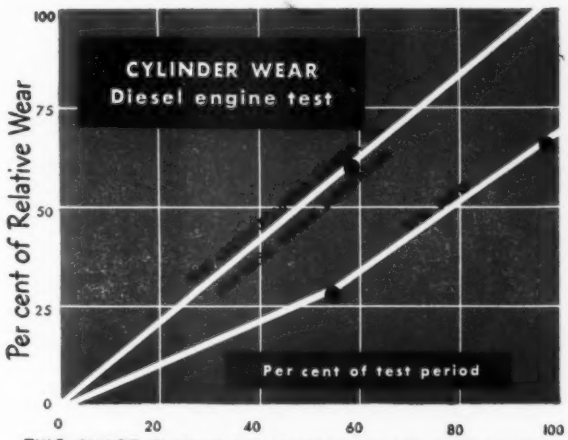
RPM DELO Oil cuts Diesel cylinder wear

Excessive wear, commonly occurring on upper cylinder walls in Diesel engines, may be reduced to a remarkable degree by switching to RPM DELO Diesel Engine Lubricating Oil.

RPM DELO Oil contains a special compound that gives it metal-adherent characteristics. Because of this quality and its natural ability to resist heat, RPM DELO Oil keeps a constant lubricant film on the entire surface of cylinders when engines are running. With the hot spots "wet" at all times, metal-to-metal contact is prevented.

The metal-adherent quality of RPM DELO Oil also keeps lubricant on cylinders and other parts when engines are idle. This assures instant lubrication when starting and reduces starting wear.

Other compounds in RPM DELO Oil remove carbon, prevent ring-sticking and corrosion, resist oxidation, and stop foaming, thus further minimizing wear on cylinders and other parts.



THIS CHART SHOWS THE EXTENT TO WHICH CYLINDER WEAR WAS REDUCED ON DIESEL ENGINE CYLINDERS THROUGH THE USE OF RPM DELO OIL

For additional information and the name of your nearest Distributor, write Standard of California, 225 Bush Street, San Francisco 20, Calif.; The California Oil Company, 30 Rockefeller Plaza, New York 20, N. Y.; The California Company, 17th and Stout Streets, Denver 1, Col.; Standard Oil Company of Texas, El Paso, Texas.

FOR EVERY NEED A **STANDARD OF CALIFORNIA** JOB-PROVED PRODUCT

Name the DRYING SPEED... Red Lead can meet it

Through the years, Red Lead's effectiveness in fighting rust has won it general acceptance by industry as the standard for metal protection.

Perhaps less generally known, however, is that Red Lead's *extra* protection is available in an extensive range of paint formulations to give you the drying speed you need.

This wide choice is due to Red Lead's compatibility with the many types of paint vehicles in use today. It can be combined with the new synthetic resins, modified synthetics, natural resins, drying oils and other vehicles.

So, whether painting schedules demand quick drying, or whether normal drying time is permitted, remember, you can take full advantage of the plus protection that has made Red Lead famous.

Why RED LEAD Means Extra Rust Protection

Red Lead has the property of counteracting acid conditions, recognized as accelerators of rust. In the presence of various acids, Red Lead forms insoluble lead salts at the approximate rate at which the acids are supplied.

This is true whether the acid originates from acid-forming environments, such as gas, smoke and moisture in the atmosphere, or from the decomposition of the vehicle. Thus, a rust-inhibiting condition is maintained with a Red Lead paint.

Red Lead also forms an adherent protective shield which prevents electro-chemical action, another prime cause of rusting.

Specify RED LEAD for All Metal Protective Paints

The value of Red Lead as a rust preventive is most fully realized in a metal paint where it is the only pigment used. However, its rust-resistant properties are so pronounced that it also improves any multiple pigment paint.

No matter what price you pay, you'll get a better paint for surface protection of metal, if it contains Red Lead.

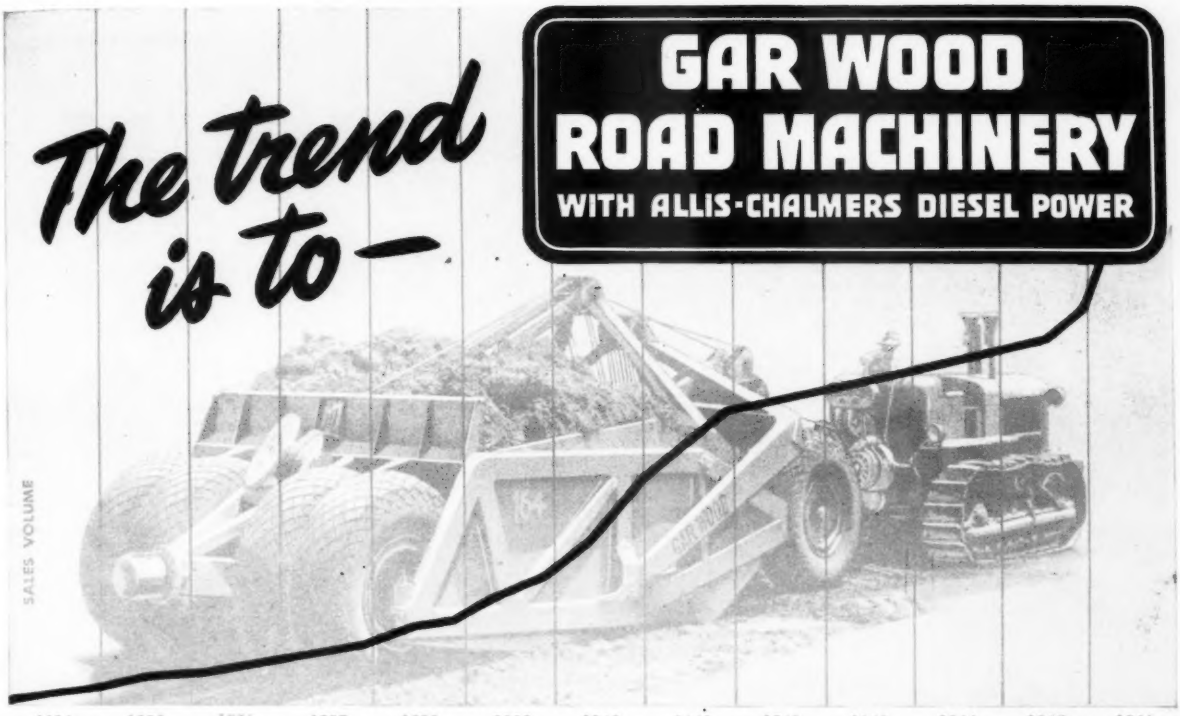
Write for New Booklet—"*Red Lead in Corrosion Resistant Paints*" is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior protection. It also includes typical specification formulas – ranging from Red Lead-Linseed Oil paints to Red Lead-Mixed Pigment-Varnish types. If you haven't received your copy, address nearest branch listed below.

NATIONAL LEAD COMPANY: New York 6; Buffalo 3; Chicago 80; Cincinnati 3; Cleveland 13; St. Louis 1; San Francisco 10; Boston 6, (National Lead Co. of Mass.); Philadelphia 7, (John T. Lewis & Bros. Co.); Pittsburgh 30, (National Lead Co. of Pa.); Charleston 25, W. Va., (Evans Lead Division.)

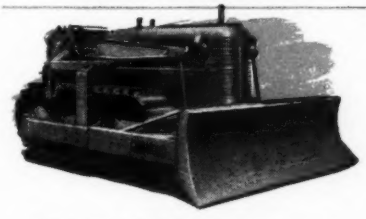
Dutch Boy
Reg. U.S. Pat. Off.
Red Lead

The trend is to—

GAR WOOD ROAD MACHINERY
WITH ALLIS-CHALMERS DIESEL POWER



4-WHEEL CABLE SCRAPERS
Capacities: 11-15-20-25 cu. yds.



HYDRAULIC DOZECASTERS with angling blades, for all Allis-Chalmers Tractors

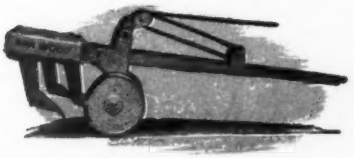
CABLE DOZE-CASTERS with angling blades, for Allis-Chalmers HD-10, HD-14 and HD-14C Tractors

On every kind of earth moving job, throughout the world, Gar Wood Road Machinery has made good, setting new high standards of performance and workmanship.

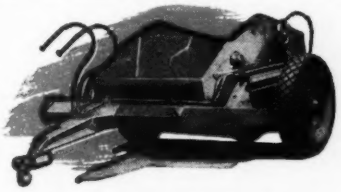
As a result, the demand for this equipment has steadily grown over a period of many years (see chart above) until now it has reached the proportions of a world-wide trend.

Here is a sound reason for specifying Gar Wood earth moving units. "Nothing succeeds like success."

Contact your Allis-Chalmers dealer. Let him point out the superior features of Gar Wood Road Machinery and show you actual job performance in your territory with many satisfied users.



HEAVY DUTY RIPPERS
Cable and hydraulically operated



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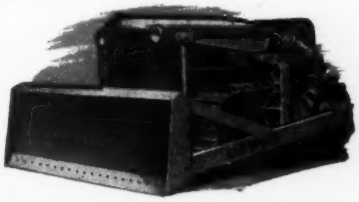

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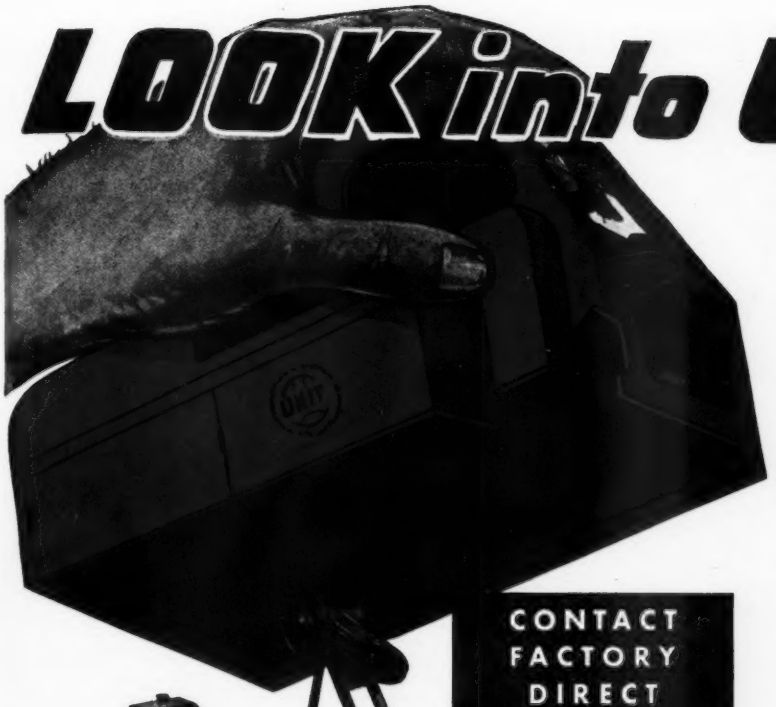

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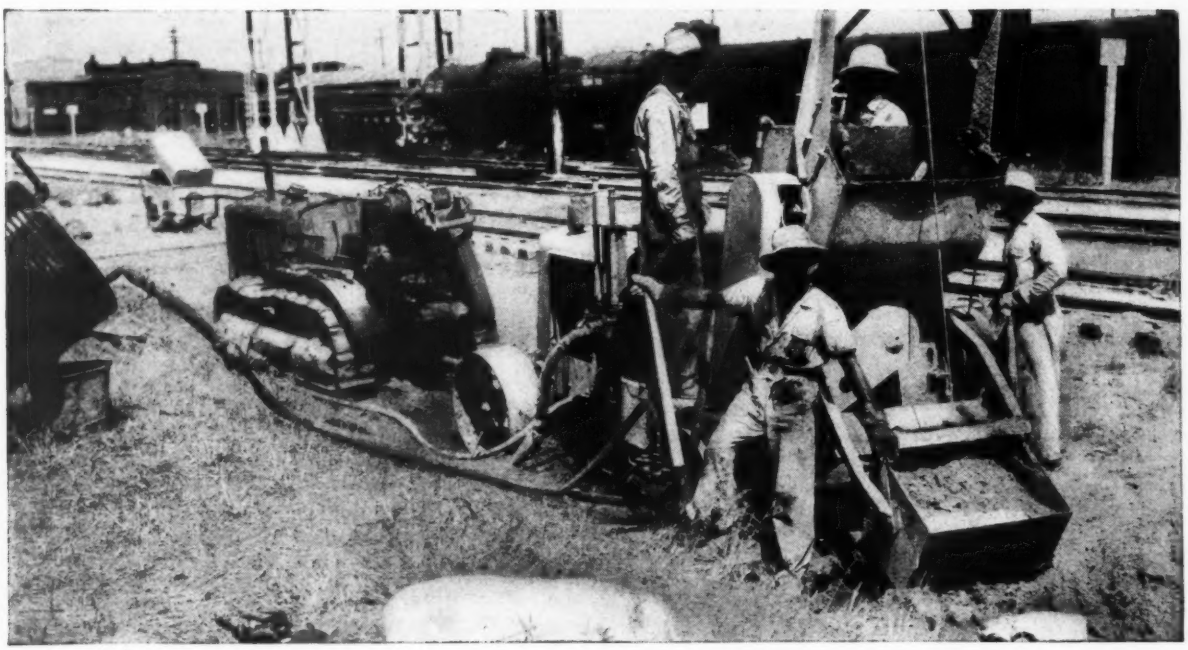

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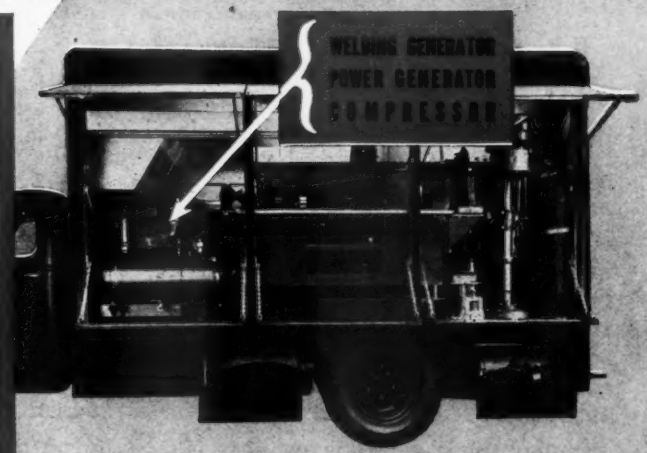
... now available— on standard trucks ... all of the repair and maintenance equipment ordinarily found only in large central service shops.



The Davey Compressor Co. is pleased to announce the production of a complete, fully-equipped repair depot "on wheels" . . . the Davey Mobile Machine Shop.

Mounted on a standard long wheel base truck, shop equipment is assembled around three basic power units, driven direct from the truck engine through the Davey Heavy Duty Power Take-off. (One, two, or all three of these units may be included as desired.)

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For complete details on how the Mobile Machine Shop will eliminate the costly practice of hauling construction equipment to central depots for repairs . . . handle pumping plant, pipe line, water station, bridge maintenance work . . . save you time, labor and money . . . write today for Booklet E-208.

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With body sides closed, the Mobile Machine Shop appears like any other truck . . . gives no indication of the vast amount of equipment it contains.

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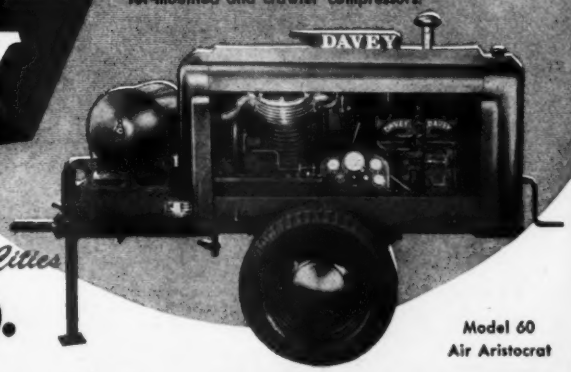

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No. 211 of a Series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
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Subject: Staff Changes

Dear Readers: July 1, 1946

Railway Engineering and Maintenance has lost a good man from its editorial staff, but, fortunately, it has gained in that same man a strong addition to its advertising sales staff. As noted in the Supply Trade News columns of this issue, John S. Vreeland, associate editor in Chicago from April, 1938, until September, 1944, and since that time eastern editor of this publication, as well as eastern engineering editor of Railway Age, has been transferred to the sales staff of Maintenance and all other Simmons-Boardman railway publications.

Combining a pleasing personality with a rare "nose for news" and unusual skill as an observer and reporter, John Vreeland's contributions will be missed in the editorial pages of this publication, and he will be missed in his old haunts about the engineering and maintenance offices of the railways, West and East. But there is satisfaction in that what may be lost to you temporarily in our editorial pages promises to be a permanent gain for you in the increased value of many of our advertising pages that can be expected through the wise counsel he will bring to manufacturers who are trying to serve you through these pages.

There is consolation, too, in that in recent weeks we have added another strong man to our editorial staff, as also noted in the news pages of this issue. To those of you who have not already met him, please consider this a personal introduction to Walter L. Turner, Jr., a graduate in Civil Engineering from Virginia Polytechnic Institute in 1935, with a number of years' experience in the engineering and maintenance departments of the Pennsylvania, and recently discharged from military service with the rank of Major.

By education, experience, ability and temperament, we are confident that Mr. Turner is qualified to serve you ably in the years ahead, as each member of our staff has tried to serve you in the past—and will continue to try in the future—to make Railway Engineering and Maintenance the most valuable publication that comes across your desk.

Sincerely,

Neal D. Howard
Editor

NDH:jb

PS.—And we're looking for another qualified young man still further to strengthen our staff in your interest.

N.D.H.

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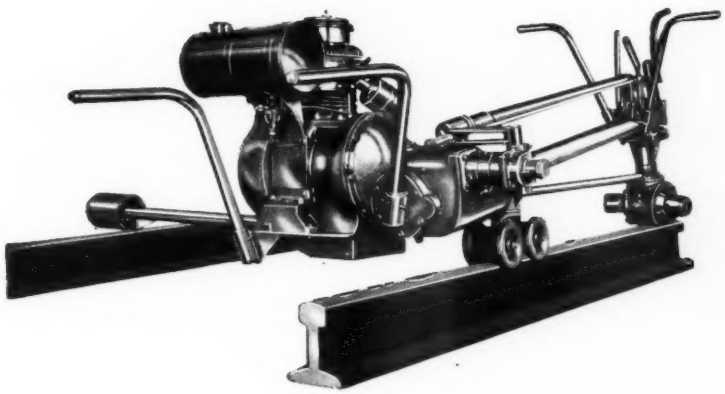
The new

Model B Raco Power Track Wrench



Its steady and insistent power either takes the nut off or breaks the bolt, without any second or third tries.

Its great power is beautifully controlled through the simplified, but even more accurate, Micro Cutout.

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Both chucks operate at same speed, and are angled in housing to coincide with center line of bolt.

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Other Raco Machines:

Model A Raco Power Track Wrench

Raco Power Tie Borer

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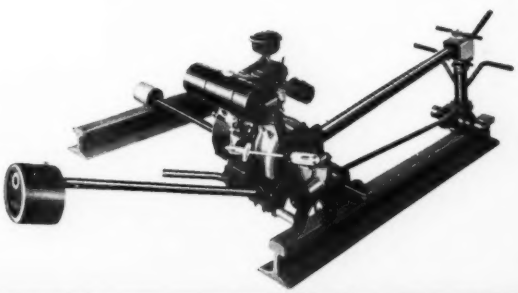

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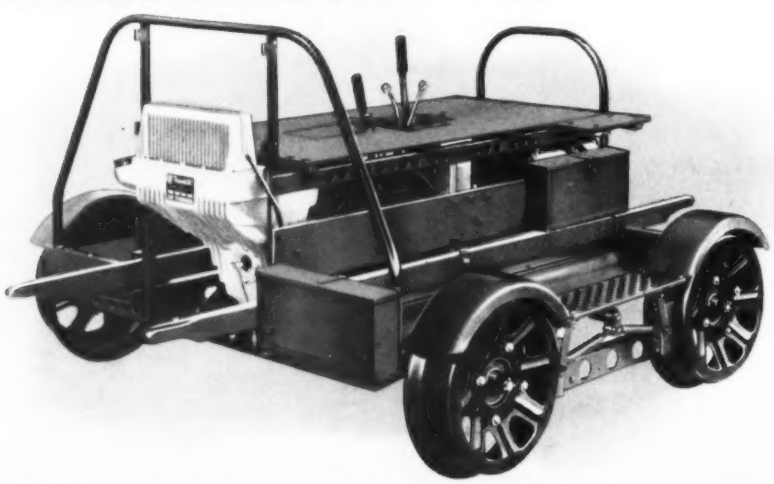

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Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

JULY, 1946

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Railway Engineering and Maintenance

Taxes—

Equitable Policy Needed Toward All Transportation

Many railway employees are concerned about the future of their industry. On the basis of the sampling of opinion among employees conducted for this publication, jointly with Railway Age and Railway Mechanical Engineer, by the Opinion Research Corporation, to which reference has been made previously in recent issues, 42 per cent of all employees (41 per cent m. of w. and s. employees) believes that competition is going to bring hard times to the railroads. Will the future prove this 42 per cent to be correct?

The answer to this question depends to a large extent upon what is meant by the term "competition." If the closely-regulated, self-sustained and heavily-taxed railroads are to continue to be challenged in the transportation field by the little-regulated, government-subsidized and lightly-taxed agencies operating in the air and on the highways and waterways, those on the railways who fear for the successful future of their industry, and themselves, may well have concern. If, on the other hand, through an enlightened employee and public opinion, equality of opportunity and treatment can be brought about for all public carriers, most of the cause for the fears of railway employees will disappear.

One of the most unfortunate factors in the present situation is that, at the moment, there is not that enlightened employee opinion, which is of such vital importance to the well-being of the railroads—and without such employee opinion, is it to be expected that the public will take an enlightened interest in the railways and their employees? Despite their apparent concern for the future of their industry, our survey discloses that 64 per cent of all railway employees (64 per cent m. of w. and s. employees) believes that, prior to the war, the railroads, airlines and waterway and highway carriers all had an equal chance to make a fair profit. And, amazing as it may seem, large numbers of railway employees are still not aware of the competitive advantages enjoyed by other forms of transportation.

When asked about differences in taxation between the railways, airways, highways and waterways, as many as 6 per cent of those questioned said there is no difference, while another 26 per cent knew of no difference. On the basis of the present number of employees on the railways, this means that more than 450,000 employees, who should be supporting their industry in seeking equality of treatment in taxation, either believe that equality now exists or do not know of the existing inequality.

If no inequality or discrimination exists, why should representatives of the railways, discussing What Next for the Railroads recently on the weekly Radio Business Forum of the Commerce and Industry Association of New York, point out that "Discrimination between privately-owned, tax-paying properties and publicly-owned, tax-exempt properties used for business purposes is America's Number One transportation problem"? Why should they point to the fact that for the first time "Public investment in highways, waterways, airports and airways," all competitors of the self-sustaining railroads, "exceeds the $28 billion of private investment in the railroads"?

Is it equality in taxation that the railways not only pay in full for their tracks, station grounds, shops and equipment, and are the heaviest contributors of any class of taxpayers to the cost of government, while the government itself contributes more than $28 billion to provide facil-

ities for competitive forms of transportation, which pay only relatively small amounts for the use of these government-financed facilities, and only relatively little in the form of taxation on the privately invested funds in them?

Is it equality in taxation that the railways pay taxes to the various states on the rolling stock moving through them on privately owned and maintained roadways, as well as on their rights of way and fixed facilities, while competitive forms of transportation using public facilities to a large extent do not pay taxes to the states on the boats, airplanes, buses and trucks moving through them, to anywhere near the same extent?

Is it equality in taxation that, as pointed out recently by Carleton W. Meyer, assistant to the president, New York Central System, that the New York Central, as one of the largest taxpayers in the city of New York, is consequently one of the largest contributors to the city's new $200 million airport; that as one of the largest taxpayers in the State of New York, it is consequently one of the largest supporters of the state's tax-consuming barge canal?

The fact is that there is not only inequity between the railways and other forms of transportation, but glaring inequity—both in the government subsidies to forms of transportation in competition with the railways, and in the taxation of the railways for the benefit of their competitors. Railway employees should know these facts, both as employees interested in the welfare of the source of their livelihood, and as taxpayers, individually, who, with the railroads, are "holding the bag" for the benefit of those forms of transportation that are not now "paying their way".

The railways are not critical of the policy of government in providing waterways and highways at public expense, but they are put to serious disadvantage by and are opposed to the government's making these facilities available to competing forms of transportation for private profit, without adequate charges to reimburse the taxpaying public and to put all forms of public transportation on an equal competitive basis. In this opposition to a grossly unfair situation, and in their efforts to right the situation, the railways should have the support of every employee.

Track Jacks—

Are Abused in Many Ways

PROBABLY no tool is more essential in the maintenance of track than the track jack; except the track shovel, few receive more abuse. The first requisite in the care and use of track jacks is never to overload them, a requirement that too often is forgotten or is overlooked in the haste to get a job done.

Like any other device with moving parts and bearings, the track jack should be kept well lubricated. Yet in too many cases this important element of the care they should receive is neglected sadly, and surfaces that come into contact with each other are worn excessively as a result. It is not uncommon to see two men working hard in operating a jack that lacks lubrication, when one man could do it easily if suitable lubrication had been provided.

A fertile source of damage to track jacks is the practice of releasing them improperly under the strain of heavy loads, especially when employed in a group on a heavy lift. In this case the jacks should not be released singly but all should be released simultaneously, so that excessive load will not be thrown on any one of them.

Instructions usually specify that, when not in use, jacks should be laid down. From the standpoint of safety, this is a good requirement, but it may result in the fouling of contact surfaces. For this reason, before a jack is used it should be examined to insure that it is not clogged with dirt and cinders.

Above all, care should be exercised in the selection of the men who are to operate the jacks. Such men should be familiar with the manner in which jacks work and with the work on which they are to be used. They should be careful when setting the jacks into position, they should watch the men who are working in the immediate vicinity, and they should be careful in other ways to see that no one is injured by any mistake in the use of the jacks.

Safety—

Inspiration Must Come From Top Down

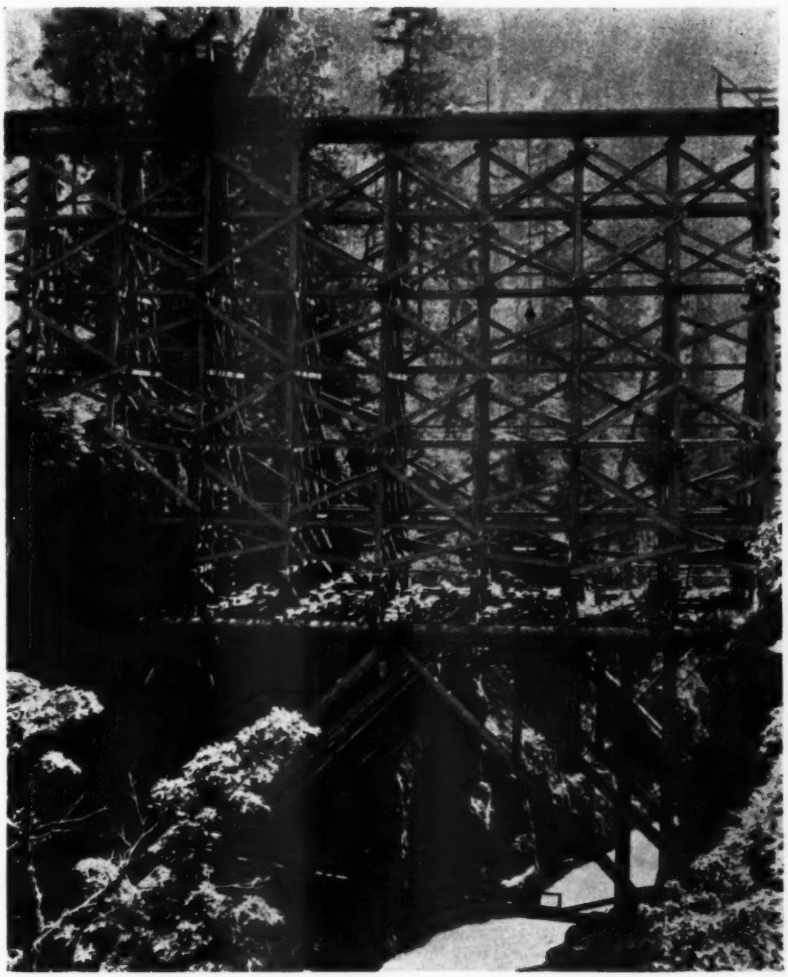
IN his paper on safety, published on following pages, George M. O'Rourke, assistant engineer of maintenance of way, Illinois Central System, makes several observations that should be kept constantly in mind by managing officers, and constantly emphasized to their subordinates. One of his most pertinent observations is that, "To be successful, safety educational work must come down from the top. It must be preceded by an indication of the management's responsibility and willingness to do its part." This is an especially arresting statement, for experience has shown that enthusiasm for safety work seldom or never seeps upward; it always comes from above.

Along the same line, Mr. O'Rourke observes that, "The attitude of supervisors toward safety is generally considered the determining factor in the success or failure of personal-injury prevention work." He also states what can be observed on almost any road, that the attitude of the supervisor is a reflection of the attitude of the division engineer. He might have gone further and traced this influence to its ultimate source, or lack of source, in the staff of managing and executive officers.

Likewise, the viewpoint of the foreman is colored by the interest and activities of the supervisor, and the viewpoint of the men in the gang will never rise above that of the foreman. The experience of the Illinois Central is a complete demonstration of the truth of Mr. O'Rourke's statements which have been quoted, and of others contained in the paper. The Illinois Central did not have a particularly bad record; it was just one of those roads that was giving routine attention to safety. When the president began to take a personal interest in safety work, the operating officers woke up to its importance and the division forces, from superintendents down to laborers, found that they were full of enthusiasm for it. The result was that the road became one of the outstanding examples of what can be accomplished by team work.

Renew Big Logs in a High Trestle

Since its construction in 1927, the high timber trestle on which the Cowlitz, Chehalis & Cascade crosses the deep and narrow canyon of the Cowlitz river in the State of Washington, has been one of the notable railway bridges of the country. This trestle, which reaches a height of 210 ft. above the stream bed consists of 29 bents, 8 of which are 80 ft. high and are carried across the river on 10 big horizontal logs which are, in turn, supported on A-frames, also constructed of big logs, the tops of which are at an elevation of 130 ft. above the bed of the river. When it became necessary to replace these big logs recently, the problem of how to do this under traffic presented itself. How it was done is told here.



Side View of Cowlitz River Trestle From Downstream During Replacement of Big Logs

ALTHOUGH it is only 32 miles long, the Cowlitz, Chehalis & Cascade, a lumber road in the state of Washington owned jointly by the Great Northern, the Union Pacific, the Northern Pacific and the Chicago, Milwaukee, St. Paul & Pacific, can boast of several unusual bridges. This line runs southeasterly from Chehalis, Wash., into the foothills of the Cascade range and, being located only a few miles south of famous Mt. Rainier, it cuts across the drainage from the eastern and southern slopes of the mountain. These streams have their sources in glaciers on the mountain and have, in general, eroded deep and relatively narrow canyons through the rugged terrain into which the railway penetrates.

As a result of this rough topography, at one point the line crosses a gorge on a 90-ft. through plate-girder bridge that sits 225 ft. above a turbulent mountain stream. Another notable structure, which will be described more in detail, is a timber trestle 420 ft. long, the deck of which is 210 ft. above stream bed. This bridge crosses the Cowlitz river, another glacier-fed stream which rises on Mt. Rainier. A second trestle, only slightly smaller, crosses the canyon of Mill creek.

At the point of crossing the Cowlitz river, about 80 ft. of glacial drift and debris overlie the rock strata which comprise the remainder of the canyon walls. This drift has been eroded to a width of more than 400 ft. at the surface of the ground, but this is reduced to about 125 ft. at the surface of the rock strata. For the next 100 ft. down to the surface of the water in the river, the width narrows to about 100 ft. It will be seen, therefore, that for 100 ft. of its depth the canyon is narrow and the walls are nearly vertical. The water is 30 ft. deep normally, but often rises to an amazing height during sudden floods.

Obviously, these conditions posed a problem in design, which was solved by installing A-frames across the narrow part of the canyon to support horizontal timbers which, in turn, carry eight 80-ft. bents across this part of the gorge. Aside from the use of the A-frames, which is unique for a bridge carrying railway loading, and the total height of the trestle, this structure is distinguished by the fact that all members of the A-frames and the horizontal timbers they support directly are unsawn Douglas fir logs, installed just as they were cut in the forest, except that they have been peeled.

A-Frames Carry Bents

It will be noted by reference to the accompanying photographs and drawings that the foot of each of the A-frame timbers rests on a prepared footing on the side of the canyon wall. These timbers average

about 58 ft. in length for the easterly legs and about 49 ft. for the westerly legs. Each leg of each A-frame supports one vertical (sawn) post and a second post resting on rock is erected just beyond the footings.

There are five of these A-frames, each of which supports two horizontal logs, which act as beams to support the sills of the 80-ft. timber bents that are carried across the chasm by the A-frames. These logs range from 112 to 125 ft. in length and are laid in pairs, tip and butt, so that the beam strength will remain constant throughout their length.

As constructed originally, the C. C. & C. extended 18 miles southeasterly from Chehalis into a heavy and almost untouched stand of Douglas fir. Its primary purpose was to handle forest products, including logs, to the sawmills that were established quickly along its line; and the lumber and timbers produced by these mills to Chehalis, where they were delivered to the Great Northern, the Union Pacific, the Northern Pacific and the Chicago, Milwaukee, St. Paul & Pacific, which roads participated jointly in the cost of the original construction and the later extension, and which now own the road jointly. An extension to Mayfield, Wash., 14 miles, was completed in 1927, and this part of the line contains the two large trestles which have been mentioned, one over Mill creek and the other over the Cowlitz river, three miles to the east.

Big Logs Support Trestle

The posts, the sills, the caps and the bracing for the 29 bents that make up the Cowlitz River trestle, 8 of which are carried on the A-frames, are sawn Douglas fir timbers and lumber, while the diagonal posts of the A-frames and the horizontal timbers they support are, as already mentioned, peeled but unsawn Douglas fir logs. None of these sawn and unsawn timbers were given preservative treatment.

During the 15 years following the construction of these trestles practically no maintenance effort was expended on either of them until 1942, except for the renewal of one or two caps and the replacement of one of the A-frames and a post supported by another A-frame. However, in 1941, indications that certain of the timbers in the Cowlitz River trestle needed replacement, led to the appointment of a committee of engineers representing the four owner railways. This committee conducted an extensive examination of the structure and presented to the owners a report which recommended a considerable amount of work. This investigation included the Mill Creek trestle as well as that over the Cowlitz river.

As outlined by the committee, the work on the Cowlitz River trestle consisted primarily of the replacement of the 10 horizontal logs which support the trestle across the chasm, and the renewal of about 1,700 ft. b.m. of other trestle timbers. However, as the renewals progressed much more work was discovered to be necessary, as will be explained later.

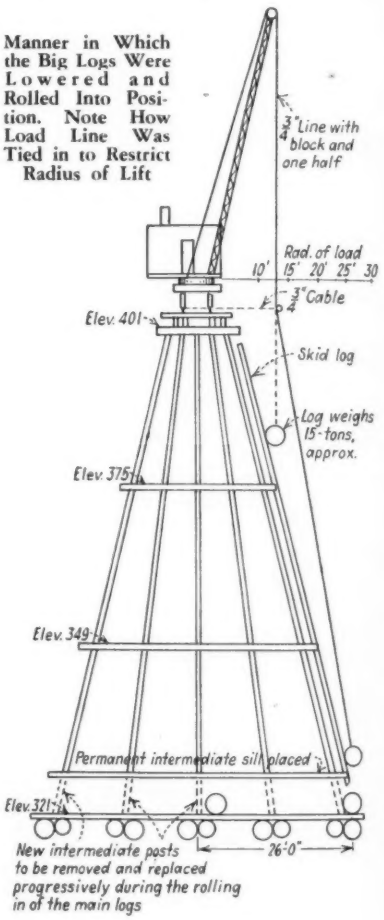
Decision to replace the big log construction in kind was influenced by the experience during a flood which occurred previously, when a sudden rise of water in the gorge carried away A-frames. When this occurred, the unspliced main logs were able to support the dead weight of the trestle until the A-frames could be replaced. The committee considered the use of built-up spliced timber chords instead of the main logs, but it was believed that they would not be strong enough to withstand floods to the extent that the logs did.

A number of plans for inserting the big logs in replacement were discussed at length by the committee, which finally discarded all but the one to be described. To understand the difficulties that faced the committee in arriving at its decision, one must visualize the situation. Here were five pairs of logs, each log being approximately 4 ft. in diameter at the butt and 3½ ft. at the tip, averaging almost 125 ft. long and weighing 15 tons.

How the Logs Were Placed

These ten logs had to be lowered from the deck of the trestle and placed under the sills of the 80-ft. bents that are required for the river crossing. At the same time the ends of the logs were to be placed on seats that had been cut into the rock sides of the canyon at the time of the construction of the trestle. Furthermore, they were to be given intermediate support at the mid-point of their length at the apices of the A-frames, as well as on the three or four intermediate posts. Added to all of these difficulties, all of this work had to be done 100 ft. above the water, and without interfering with traffic.

In pursuance of the plan adopted, the first step was to cut off the main posts of the eight 80-ft. bents at a height of seven feet above the existing sills and to place a permanent sill in each bent at the height of the cut-off, and to insert short posts between the upper and lower sills. Two independent sets of sway bracing were then installed for each of the eight bents, one above the new sill and one below it. The former was fastened permanently and rigidly in place, using three boat spikes at each intersection, while the latter was held in place by bolts. This allowed the lower ends of these braces to be loosened and raised to clear the new or replacement logs as they were


¾" Line with block and one half
Rad. of load
10' 15' 20' 25' 30
¾" Cable
Elev. 401
Skid log
Log weighs 15 tons, approx.
Elev. 375
Elev. 349
Permanent intermediate sill placed
Elev. 321
New intermediate posts to be removed and replaced progressively during the rolling in of the main logs
26'-0"

Manner in Which the Big Logs Were Lowered and Rolled Into Position. Note How Load Line Was Tied in to Restrict Radius of Lift

rolled into place from the downstream sides of the bents, and the short posts to be removed progressively to accommodate this movement of the logs.

While the installation of the new sills and the changes in the bracing were under way, the logs were being selected and prepared for use. They were purchased from the Carlyle Logging Company, a local outfit operating in the forest adjacent to the line, for $100 each, not including the cost of peeling and framing. As soon as the trees were cut and the logs loaded, they were hauled to the framing yard, which was located a short distance from the bridge on

the south or Mayfield side of the river.

Levels and careful measurements had been taken previously for the purpose of preparing a framing plan for each log. In the framing yard, the logs were peeled, but only the daps for the underside of each log were made, and the shaping of the ends was done to fit the original seats in the canyon walls. The daps for the sills were made after the logs were in place.

Lowering the Logs

In preparation for the placing of the logs, two log skids, each about 75 ft. long, were hung from caps on the downstream side of the trestle, terminating just above the main-bent sills that rested on top of the big logs. This gave a smooth skid surface for the lowering of the logs and avoided any damage to the batter posts, the intermediate sills or the bracing. The logs were then loaded one at a time on a flat car and moved out onto the bridge, with a locomotive crane at each end of the log.

As soon as the cranes were in position to lower a log, the wheels were blocked, the outriggers were placed and the rail clamps were affixed to the rails. The tackle used in the lowering operation consisted of a ¾-in. steel cable, with a block and a half on each crane. When ready, the log was picked up from the flat car and swung out over the side of the trestle. When the booms had been swung to a radius of 12½ to 13 ft., the lines were tied in, as shown on the accompanying sketch, so that the pull on the cranes was stabilized at this radius. The log was then lowered slowly, being kept as nearly level as practicable, down the skids to a position at the ends of the sills approximately 80 ft. below the elevation of the caps.

No effort was made to rush the work or any phase of it; on the contrary, every move was made deliberately to avoid the possibility of accident. A careful check of the time required for the various operations, however, showed that it required 1 hr. 15 min. to move one of the logs from the framing yard to its final position on the sills. As soon as the log had been lowered to the elevation of the top of the main sills, the first line of short posts on the downstream side of the trestle was removed, the braces were lifted and the log was rolled in. The posts were then replaced and the bracing restored. This operation was repeated progressively for the remaining posts until the log had reached a point on the sills near its permanent bed. This latter operation, including the removal and replacement of the posts and braces, also required 1 hr. 15 min., or 2 hr. 30 min. for each log from the framing yard to a position from which it could be installed.

When the first two logs had been rolled in, and were ready for insertion under the upstream side of the trestle, the A-frame that was to support them was tied securely in place so that it could not shift. When this was finished, that portion of the main sill of each of the eight bents directly over the first two logs to be replaced was cut and removed. The old logs were then cut into short lengths and lowered to the river. The old brace blocks, the posts supporting the big logs and the caps at each support were replaced, and the new logs were then lowered to the new caps and bolted into place. When this part of the work had been finished, the short posts were replaced, but were allowed to rest temporarily on blocking set on the big logs, until all of the big logs were in place and new sills could be installed.

However, when the corbels and post caps were removed from the A-frames, it was found that the heads of the diagonal logs comprising the A-frames were rotted quite badly. No form of protection or of treatment to retard decay had been provided at the time of the original construction, or at any time later during their service life. Obviously, in this condition, these A-frames would constitute a danger to the stability to the structure within a relatively short time; consequently, it was decided to replace them while the bridge was open and the work could be done under the most favorable conditions. As a result of this decision, four of the A-frames were replaced with new timbers, the fifth, the second from the downstream side of the trestle having been renewed in 1939 as a result of a flood. As might have been expected, this operation was the most difficult, the most time-consuming and the most expensive part of the entire program of renewals.

When the four A-frames had been renewed and all of the big logs were in place, new timbers for replacing the eight sills, which had been cut out piecemeal to allow the big logs to be lowered onto the A-frames, were framed and brought in singly and slid into position for insertion. The bent was then supported by blocking on the big logs and needle beams. The short posts and the blocking upon which they had rested were then removed and the sill was shifted to final position after the logs had been dapped to receive it. Following this, the posts and braces were replaced, this entire operation being repeated for each bent until all eight sills had been renewed.

In general, the work of repairing the Cowlitz River trestle went along smoothly and uneventfully, almost in a routine manner, until after the ninth log was rolled into place. Then, when log No. 10 was rolled in, it struck against No. 9 somewhat forcibly and was knocked off its seat and fell down through the bracing to the rocks below, where it broke into several pieces. It became necessary, therefore, to cut a new log and peel and frame it, the work being held up until this could be done.

No Personal Injuries

Fortunately, this was the only accident on the entire work, and it was equally fortunate that it caused no personal injuries; in fact, no personal injury of consequence occurred at any time during the progress of the work. This speaks well for the care with which the job was planned and executed. It is also a favorable commentary on the character and ability of the supervision that was employed on the work, since it goes without saying that delicate and ticklish situations are likely to rise suddenly and unexpectedly at any time on work of this character, which might lead to disaster unless handled promptly and carefully, and which no amount of foresight can prevent.

The replacements described were made at a time when labor was particularly scarce, so that neither the C.C.&C., itself, nor the owner roads, was in a position to supply the forces necessary to make the needed replacements. Inquiry also developed that contractors generally were not interested in the work on the A-frame and big-log span, since it was so unusual in character and, even under the most favorable conditions, the placement of the big logs was likely to be a difficult process.

Furthermore, there was no background of experience which would enable a contractor to bid on either a unit or an overall basis. Eventually, the work was awarded to the Hart Construction Company, Tacoma, Wash., as the only one of the firms canvassed which was willing to undertake the work and capable of carrying it to completion. The contract with this firm covered the Mill Creek trestle, as well as the one over the Cowlitz river. The Mill creek work involved the replacement of 71,450 ft. b.m. of sawn timbers, including sills, posts, braces and blocks, but except for the size of the structure it involved no particular difficulties.

Foremen on the I.C. Are Entitled to Wear Buttons Like This if Their Gangs Have Worked Certain Periods With No Personal Injuries, Ranging From Four Months to Three Years

Personal Injuries

In 1945 the Illinois Central stood second among the railways of the United States with respect to the excellence of its safety record. In this paper, which was presented at the March meeting of the Maintenance of Way Club of Chicago, Mr. O'Rourke tells many things concerning the methods and the efforts that have been responsible for the marked improvement in the safety record of this road, which placed it so near the top of the list of all of the roads in this country, measured by its safety performance.

LAST November C. H. Mottier, vice-president and chief engineer of the Illinois Central, which is my railroad, in an address before this club on What Is Ahead of Us, said:

> We must reduce every form of waste, such as fire losses, derailments, accidents of all kinds, and personal injuries. Throughout the war period on our railroad, we have been concentrating on these items of conservation, and our experience indicates that much can be accomplished. Time will not permit me to tell you in detail how we have been able to make progress in these respects. I am sure, however, that our results will be interesting.

Mr. Mottier then told you that during the first ten months of 1945, of 1944 and of 1943 we had 55, 85 and 101 personal injuries in that order. The final figures at the end of various years for the maintenance-of-way department are, 1945, 61 injuries, ratio 2.68; 1944, 96 injuries, ratio 4.11; and 1943, 118 injuries, ratio 5.25. Mr. Mottier went on to say:

> Last September we set up an unusual record on our railroad. For the first time, we went through an entire month without a single reportable injury in the maintenance of way department. In the same month we did not have a single reportable motor-car accident. There have been but five months in the past five years in which no accident of the latter type occurred.
>
> I have not given you these figures to advertise the success of our efforts, but I know, from being on the inside, that this improvement has been achieved only through an immense amount of hard work and conscientious effort directed toward a definite objective. Progress has been made only through the complete cooperation of all employees in this department.

The chairman of your program committee requested me to take up at that point and tell you some of the things we do on the Illinois Central to get the results described by Mr. Mottier, and those we hope to get in the future. In doing this, there is little I can add to Mr. Mottier's statement that our results have been achieved by hard work, conscientious effort and co-operation.

Since the beginning, our management has recognized the necessity of diminishing the needless suffering of workers and their families arising from preventable accidents, and constantly is conducting a campaign of education to reduce these personal injuries. Executive responsibility and supervision in safety-promotion work to ameliorate the suffering resulting from lost-time personal injuries led the management to set up an organized and centralized safety department headed by our director of personnel, who ever since has devoted the time necessary to education, organization and the "follow through" that is vital to success.

In recent years, safety-promotion supervision has been emerging more clearly from that confusion of activities accompanying the operation of a railroad, and scientific planning and careful research have been carried on to find the best methods and means to be employed to reduce the accident expense account. Research aimed at the improvement of safety rules and safe practices is commonly termed applied or objective research, and is recognized generally as industrial research. Through it we hope to accomplish some of the following things:

(1) Anticipate and prevent accidents and personal injuries.

(2) Cure existing hazards or bad practices.

(3) Reduce the cost incident to lost-time injuries.

(4) Develop new methods of accident prevention.

(5) Bring about better personnel relationship.

(6) Assemble information leading to a better understanding of safety.

(7) Contribute to the common store of general knowledge of safety in maintenance of way and structures.

To be successful, safety educational work must come down from the top. It must be preceded by an indication of the management's responsibility and willingness to do its part in providing safe working conditions and safe tools and equipment, thus removing hazards at their source. That the management of the Illinois Central does recognize this is evidenced by the following quotation from the declaration of policy of the Illinois Central, as maintained by our president, Wayne A. Johnston:

> To make our railroad a good place to work, by paying reasonable wages, giving employees fair treatment, and providing them with tools to do good work.

With the chief executive taking active leadership in safety-promotion work, effective results will be produced through continuous well-organized effort, recognized officially as an integral part of efficient maintenance and operation.

As a phase of research, our safety-rule book recently underwent a major operation. Based on the experience and knowledge gained in recent years, we trimmed here and added there until we were satisfied that we had the best rules possible to meet present-day safety requirements. In revitalizing the rules, we were careful not to take out any of the essential parts. As a result, now, as before the revision, the first sentence in the safety rule book is "Safety is of the first importance in the discharge of duty." I am sure this sentence or its equivalent has a prominent place in the safety and maintenance rule books of every railroad here represented.

Just why is safety of the first importance in the discharge of duty? Because, to attain a high standard of safety, we all must come to realize the full value of true safety to every

es Can Be Reduced

By GEORGE M. O'ROURKE
Assistant Engineer Maintenance of Way
Illinois Central, Chicago

phase of railroad maintenance. In revising our rules for the maintenance of way and structures department, in 1942, the safe way to perform work was emphasized.

The development of a correct safety attitude among subordinate officers constitutes the first and most important step in the educational work of the organization. Friendly competition is a stimulus to good safety records. Contests between divisions of the railroad and between departments have been found effective. The desire to excel, when encouraged by competition or recognition of merit, is a strong force for the prevention of accidents.

Recognizing this, and wishing to show some tangible evidence of the company's appreciation for exceptional safety effort, our late president, L. A. Downs, in 1929, presented a trophy known as the president's safety cup, to be awarded yearly to the operating division making the greatest per cent of casualty reduction during the year. Starting in 1940, a new president's trophy award was inaugurated on our road, donated by our late president, J. L. Beven, and has been awarded each year to the division having the lowest ratio of reportable casualties to employees per million man-hours worked. The trophy has been awarded at the close of each year and the division winning it has been permitted to retain it throughout the year. This trophy has never become the permanent possession of any division, but a miniature replica has been presented to each of the divisions winning the trophy, which remains permanently in the possession of the division as evidence of its having won the trophy. All of the sub-departments of a division — transportation, mechanical and maintenance-of-way— are included under this award. The Mississippi division was awarded the trophy for 1945 with a casualty ratio of 2.07.

As a further means of advancing the safety movement in every possible way and to increase the incentive in the maintenance-of-way department, the chief engineer maintenance-of-way, in 1939, offered a plaque to be awarded annually to the division engineer whose division achieved for the past year the lowest casualty ratio per million man-hours. Each year the name of the winning division engineer is engraved on the plaque, and the winner is awarded possession of the plaque for the entire year. At the end of 1945 this plaque also was award to the Mississippi division with a casualty ratio of 1.12.

During the latter part of 1942, C. M. Chumley, engineer maintenance of way, also inaugurated a system of safety recognition by means of awarding safety buttons to foremen and assistant foremen, outlined as follows:

After four months have elapsed, each foreman who has gone without injury in his respective gang is entitled to wear a four-months no-injury button. Similar buttons are awarded for eight months, one year, two years and three years. If an injury occurs, the foreman surrenders his button until such time as he is again eligible to wear one. Commencing with January, 1946, a motor-car accident carries the same penalty as a personal injury.

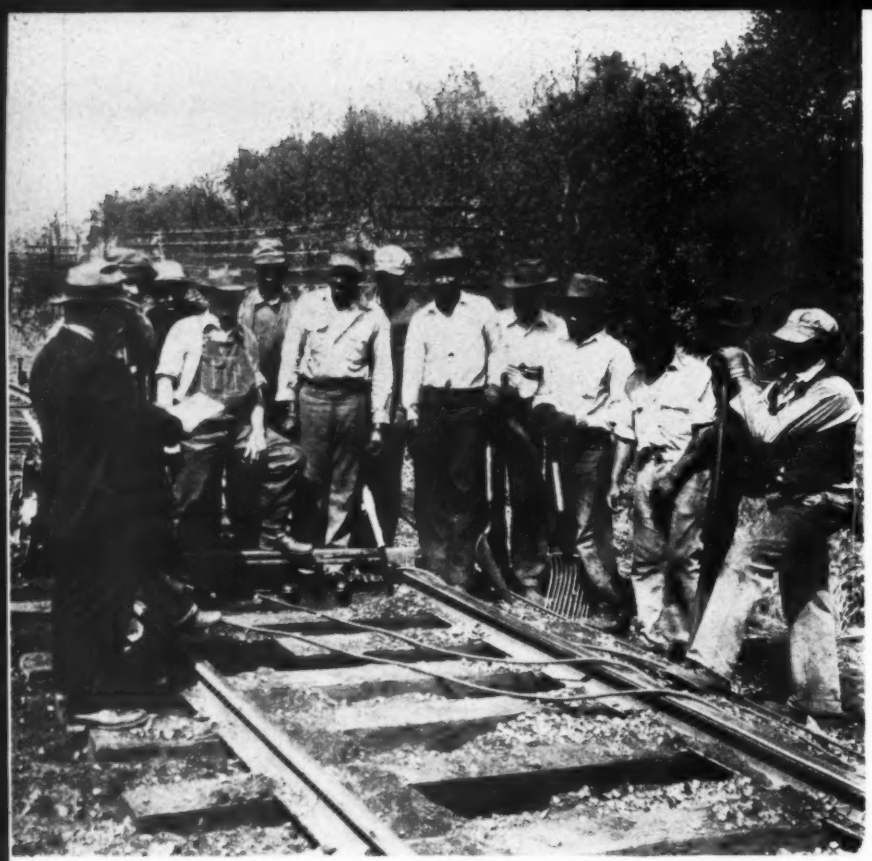
The main benefit of this system grows out of the fact that the award is based on all injuries, minor lost-time as well as reportable. It is felt that by recognizing the importance of preventing minor lost-time injuries, the more serious reportable injuries will be curbed.

"The attitude of supervisors towards safety is generally considered the determining factor in the success or failure of personal-injury and motor-car accident-prevention work. This attitude is influenced directly by the division engineer, whose repeated indication of the importance attached to safety promotion by the management is essential. There is one fundamental principle underlying all effective safety-promotional activities, namely, safety is an integral part of good-engineering practice and, therefore, an important supervisory function."

Monthly Statements

Monthly, during the year, the director of personnel sends out to all concerned a statement of the standing of the divisions and also of the several departments, with respect to casualties to employees on duty, based on Interstate Commerce Commission figures, which include only injuries where more than 72 consecutive hours or three days out of the first ten following the injury, were lost. Also a monthly graph is issued showing the current monthly injury ratio of each division and department, compared with the best monthly ratio during the preceding five-year period. Another monthly statement is distributed analyzing the reportable personal injuries occurring on each division. In this way, and through discussions at meetings in the offices of the general manager and the engineer maintenance-of-way, the division superintendents and division engineers are informed of the standing of their divisions in the race for the president's trophy award.

These and other statements, includ-



Impromptu Safety Meeting Being Addressed by a Supervisor on an Inspection Trip

ing safety-news letters, posters, bulletins, cartoons, photographs, safety-merit cards and employees magazine do much to convince employees of the importance of safety.

Another means of encouraging safety promotion work is our employees' suggestion system. It is operated as a department through permanent committees meeting once a week on each division under the supervision of a general committee in Chicago. Experience has convinced the management that the least important employee may be in a special position to suggest improvements in safety promotion. Liberal cash payments are offered for ideas found to be practical.

Safety Meetings

Through all of the safety committee meetings, from executives to foremen, the same subjects are gone over repeatedly. In addition to those already mentioned, there are:

Accidents resulting from the operation of motor cars—persons killed and injured—compared with same period last year.

Analysis of injury causes and methods of prevention.

Circumstances surrounding serious accidents or near accidents, and the means for preventing recurrence.

Placing of responsibility for developing a preventive attitude among trackmen and mechanics.

Protective measures, such as the wearing of goggles and safety shoes.

Correctly designed and well-maintained tools.

Methods of making field checks and surprise tests to know that tools are loaded correctly and transported safely on motor cars.

Compliance with speed restrictions and other motor-car rules.

Selection of new men and instruction of inexperienced men and returned service men.

Investigation of all casualties, and discipline of justifiable severity when warranted.

Seasonal precautions, such as special arrangements to protect men during freezing weather and snow storms, when the hazards are greatly increased by reason of the many men on the track, poor visibility, and the necessity for the men to be heavily clothed, particularly with their ears covered.

The division engineer's safety committee is composed of members of his staff and selected subordinates. The supervisors, in turn, hold meetings attended by the foremen. The most successful of such meetings are those conducted for the express purpose of placing responsibility upon individual employees for the elimination of unsafe practices. All present are encouraged to describe conditions and practices considered unsafe so that arrangements may be made to correct them. Any rule violation observed by a supervisory employee should be discussed and analyzed. If ignored without correcting the violator, more violations are encouraged.

The attitude of supervisors towards safety is generally considered the determining factor in the success or failure of personal-injury and motor-car accident-prevention work. This attitude is influenced directly by the division engineer, whose repeated indication of the importance attached to safety promotion by the management is essential. There is one fundamental principle underlying all effective safety-promotion activities, namely, safety is an integral part of good-engineering practice and, therefore, an important supervisory function.

Supervision Determines

It is obvious that, in the final analysis, the quality of supervision will determine whether true safety is to be achieved. The supervisor is the foundation on which a safety structure must be built. It is his job to make certain that safety is given primary consideration in all that is done. This means that, to sell safety to his subordinates, a supervisor must first sell safety to himself. After the supervisor has convinced the men by word and deed that he, himself, is sold on safety, his next step is to make safety attractive to them.

He must impress upon them how safety affects them personally, reciting the benefits to be derived from working safely and the consequences of working unsafely. He must point out that the rules are not to be followed solely because they are rules, but because they are practical common sense, based on hard-earned experience and passed along to them in the interest of their protection against injury. He must combat the conviction ingrained in the average person's mind, that accidents happen to some one else. We on the Illinois Central insist that these things be done, and the record that has been made by our railroad has been the result of very close supervision and excellent co-operation of our employees.

The Illinois Central came within a hairbreadth of having the lowest employee casualty ratio of any major railroad during 1945, missing by only 0.08 of one casualty per million man-hours of being first among all Class I railroads. The Texas & New Orleans, a part of the Southern Pacific, won the distinction of being the safest railroad for its employees with a ratio of 3.36 casualties per million man-hours. The Illinois Central ratio of 3.43 won second place among the nation's railroads. This achievement was the best in its history, and represented a long stride forward from the casualty ratio of 6.41 in 1944, which.

in itself, was an excellent performance.

Supervisors make it one of their principal duties to talk to the foremen and men in their departments at every opportunity about the avoidance of motor-car accidents and personal injuries, and an earnest effort is made to impress upon the foremen that they are the key men who can do more than anyone else to eliminate personal injuries. The idea of making the foremen feel their responsibility is most essential, and we know from numerous personal talks with foremen and their men that considerable progress has been made in this direction on our railroad.

Closer Observation

Supervisors and others are watching gangs more closely to see that work is done in a safe manner, and if they see any violations, the man's attention is directed to the fact at once, and corrections are made before the entire gang in a dignified manner without shouting and unnecessary talking, so as not to take the minds of the men off their job. High-pressure tactics have no place in selling safety. Success lies in constant, sincere instruction based on knowledge and practical experience.

On motor-car inspection trips, we have established a practice of division engineers and supervisors talking informally with gangs, stopping the men in their work to discuss motor-car accidents, personal injuries, and methods of doing work to comply with safety and with the rules of the maintenance of way and structures department. We believe this is of more benefit than all of the letters that can be put out, and it is our observation that, as a result, the gangs have shown more interest in doing work safely and in watching others working around them, to see that they are also safety minded.

Some interesting points have been brought out in the discussions at these meetings, in which the laborers availed themselves of the opportunity to take a part. We are convinced that most of the employees in the maintenance-of-way department are interested in safety and are becoming more so every day, and we can think of no better explanation for our improved performance.

Must Teach, Not Tell

When such talks are made, we stress to the foremen that just to tell his men to be careful is not sufficient. We insist that they do work in a safe way and generally there is a safer way than that in which it is being done and this is usually a more efficient way. How many supervisors today are simply telling the men "Do not get hurt," then, when an accident or injury occurs, saying, "Why did you get hurt, I told you to be careful." There is a lot of difference between telling a man not to get hurt and instructing him in the correct way to do the job safely and efficiently. Let us ask ourselves whether we are teaching or telling. If we are teaching, the employees can say, "We have been trained to do our work safely."

When new men are employed or men return from the armed services, our foremen impress upon them the importance of the safety program and instruct them carefully before they actually perform any work. Supervisors contact these new men and returning war veterans as quickly as practicable to be sure that their foremen have instructed them satisfactorily.

"At times there is too much of a tendency to handle safety by itself—as separate and apart from the job. As a matter of fact, true safety is the very core of the ordinary day-by-day elements of railroad maintenance and operation. We believe we are making progress in teaching this principle. Of the 101 supervisors of track, bridges, water service and signals on the Illinois Central, 63 passed through the entire year of 1945 without a reportable casualty to a worker under their supervision."

The whole thing sums up to this: you must first sell yourself on safety and then you must arouse the employee's interest in safety and in what safety means to his personal well-being as well as to those with whom he works. Present safety information clearly, completely and repeatedly, and when talking with the employee test his understanding of the safety instructions by having him explain his understanding of what you have presented to him, giving him full opportunity to ask questions.

How successful any salesman becomes depends largely on his knowledge of the product he is selling. Thus, to sell safety, a supervisor must analyze every operation of every job under his control to determine how each move can be made with safety. With knowledge thus gained, the supervisor can do more than merely tell his men to be safe.

One means of maintaining interest in safety is the safety calendar, which is a sheet on which is drawn the current daily calendar with a safety-rule number inserted under the date. Each morning before starting the day's work, the designated rule is read and discussed by members of the gang. The initials of the man reading the rule are inserted and, at the end of the month, the calendar is returned to the division engineer with the time roll. This keeps all of the rules before all of the men and tends to keep their minds on safety and the prevention of motor-car accidents.

The safety calendar reminds men in bridge and building gangs, painters, pumpers and signalmen, who do not have as frequent contact with supervisors as do trackmen, the importance of safety.

Many Other Schemes

Other schemes to maintain interest in safety are:

A monthly report showing the number of days a supervisor goes without a reportable personal injury, giving the date of the last reportable injury and showing the rank of each supervisor.

A monthly report showing the number of employees working and the number wearing safety shoes, with the greatest percentage giving the supervisor top rank.

A monthly report showing the position of each division in the competition for the maintenance-of-way trophy, based upon casualties per million man-hours.

Each casualty, large or small, is investigated by the supervisor. The result is broadcast to all employees to aid in preventing a recurrence.

Reportable injuries are analyzed by making a formal investigation. This emphasizes to the entire force that the day is past when rule violations resulting in injuries and accidents will be dismissed lightly.

We are all familiar with the necessity of following up each minor injury and getting the man back to work to avoid the occasional malingerer victimizing his employer. It is, of course, necessary to have the co-operation of the employee and company physician to obtain the doctor's release.

Every injury is considered potentially reportable, and every precaution is taken to reduce this probability. The injured person is sent to a doctor

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Grouted Roadbed Holds Up Under S

Because of unstable subgrade conditions, many special trackwork installations on the Terminal Railroad Association of St. Louis were pressure grouted nearly four years ago. This treatment has proven effective, the track holding up well under the heavy traffic of the war years, with substantial reductions in maintenance. The conditions existing at several locations prior to treatment, the methods used and the results obtained, are described in this article.

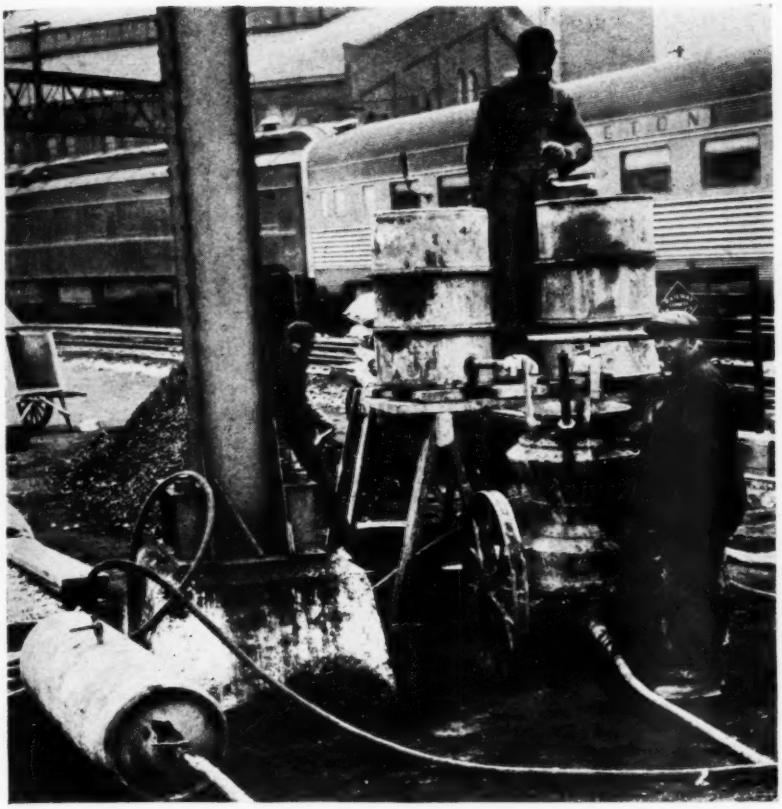
WHAT benefits can be expected from the stabilization of special trackwork by roadbed grouting? Will such locations stand up under heavy traffic? What mixture of grout will give best results? A partial answer to these and a number of related questions can be found in the experience of the Terminal Railroad Association of St. Louis, which pioneered in the grouting of unstable roadbed at crossings and other special trackwork.

Nearly four years have elapsed since the Terminal Association began its first experiments in this work, years which, by virtue of the heavy war-time traffic, have afforded a thorough testing period—and the results have been highly satisfactory. For example, a number of extensive special trackwork installations, which in previous years required an abnormal amount of labor to maintain them in proper line and surface, have been so stabilized by grouting that, since treatment, only a comparatively small amount of routine maintenance has been necessary.

In all of the grouting to date the Terminal has used relatively simple pneumatic grout-placing equipment, and the grout itself has been a rich mixture of Portland cement and water, except during the earliest work, when unsatisfactory experiments were made with a number of sand-cement-water mixes.

The total clear length trackage of the Terminal Association in and about St. Louis is only 367 miles, but because of its character, including many units of special trackwork, coupled with unstable ground conditions at many points, track maintenance has presented many difficult problems. The Association lines embrace a complex arrangement of interconnecting trackage on both sides of the Mississippi river, which is crossed at three locations in the St. Louis district, and include an outer belt line which extends around the north and west sides of the city. In the St. Louis Union passenger station, the largest stub-end station in the country in terms of trackage, the Association provides station facilities for 17 trunk lines. In addition, it also performs much of the interline switching between the 25 roads with which it has connections.

Because of this complex arrangement of tracks and service, many installations of special trackwork have been necessary. At the Union Station,



Far Left—Grand Crossing in the Union Station Layout Where Subgrade Grouting Has Materially Reduced Maintenance Problems. Near Left—The Grouting Equipment Used Includes a Mixer, Pressure Chamber and Discharge Lines

Special Trackwork at Busy St. Louis Terminal

for example, where there are 42 station tracks, the layout involves 97 single switches, 60 double-slip switches, 5 movable-point crossings and one multiple crossing where three tracks cross three other tracks at grade. Other special trackwork is found at many other places on both sides of the river, including the busy Relay station in East St. Louis, Ill., where a large amount of the freight and passenger traffic from 10 lines is handled.

Many Unstable Locations

On the Missouri side of the river, much of the Association's property, including the Union Station, is on filled ground in what was formerly Mill Creek valley, the fill being underlaid with soft blue clay which in some places is more than 60 ft. in depth. In periods of wet weather, water reaching this clay forms it into a plastic, unstable mass, which not only permits settlement of the track, but which frequently works its way upward into the ballast, completely fouling drainage. Similar clay deposits, causing equally unfavorable conditions, have been found along the belt line, and across the river in Illinois there are many roadbed fills containing a wide variety of materials ranging from gravel and cinders to a fine moulder's sand, which have given almost constant trouble. Some of these fills have become tightly caked with clay, which tends to lubricate them during wet weather, while in others large water pockets have been formed, resulting in highly unsatisfactory conditions, particularly at crossings and other special trackwork installations. At certain of these places, unusually heavy train movements have made almost constant attention necessary.

One of the first trackwork installations to be grouted on the terminal was at 14th St., St. Louis, on the six-track approach to the Union Station from the east, where much trouble had been experienced in maintaining the proper surface on four double-slip crossings. Here, beyond the leads directly to the station tracks, and subject to a particularly heavy volume of both freight and passenger traffic, the roadbed is on a soft clay of undetermined depth. In the grouting, injection points were driven at 5-ft. intervals along both sides of the crossings, directly at the ends of the ties, for a distance of 225 ft., as well as in the centers of, and midway between, the tracks, and a cement grout was used. Since the completion of this work in November, 1942, it is estimated that maintenance has been reduced 50 per cent.

Grand Crossing, immediately south of the Union Station, was also one of the more important of the locations on the Terminal which received early grout treatment. Here, three tracks cross three tracks at grade, each group of tracks serving to connect 16 of the 42 station tracks with the main approaches to the station. Train movements over these crossings, while slow, are very frequent, averaging more than 700 daily. The subgrade beneath the crossing is a fill on the old bed of Mill creek, below which is a deep layer of the blue clay previously referred to. The ballast has been a deep section of 1-in. crushed limestone, but, in spite of this, especially during wet weather, the clay worked up through the fill and ballast, producing a condition under which it was impossible to hold a surface. To overcome this condition, the top of the fill was at one time removed to a depth of three feet below the ties and was replaced by layers of rip rap, crushed rock, fine gravel and sand. At the same time a network of tile drains, with 12 surface inlets, was installed under the crossings. In spite of these measures, the improvement effected was temporary in character, the clay persisting in working upward, and fouling the ballast, with the result that the crossing needed a complete surfacing each month.

The crossing was pressure grouted in December, 1942, and although the temperature was below freezing at the time, no difficulty was experienced.

The tile drains installed previously were found to be completely filled with dirt and mud and, after being cleaned, were kept clear during the grouting by flushing with a fire hose at the various inlets.

In the grouting, injection points were driven diagonally under the corners of each of the nine crossings, as well as at certain other points as seemed desirable. The grout was accepted freely and considerable water was displaced from beneath the tracks. Since being grouted, now more than three and one-half years, the only necessary work on the crossings has been occasional spot surfacing at intervals of several months, in spite of the heavy traffic that has prevailed.

Other Crossings Treated

The next location to be treated was at the Relay station in East St. Louis, where some 700 freight and passenger train movements are made daily over 12 crossings and other special installations. The roadbed here is a rock fill, but in spite of this the track was so unstable as to require a monthly surfacing. Since the grout was applied, the intervals between surfacing have been extended to five months.

Other locations grouted in the earlier stages of this work on the Terminal were the Louisville & Nashville crossing and the Baltimore & Ohio crossing, both in East St. Louis. At the former location four crossings are supported on a bed of fine moulder's sand, and at the latter point there are nine crossings on a similar foundation. Both of these points had been most troublesome, some of the individual crossings at the B. & O. installation, for example, requiring almost constant maintenance. Since grouting, the amount of attention necessary at these locations has been materially reduced.

One of the last of the earlier applications of grout on the Terminal was at Winstanley station in East St. Louis, where a total of eight crossings carry the T.R.R.A. tracks over those of the L. & N. and the St. Louis & O'Fallon. Here, where a large volume of heavy freight traffic is handled, the track is on a fine, sandy subsoil, with the tops of the ties only slightly elevated above the surrounding ground level, a condition which had given considerable trouble up to the time of grouting. Since grouting, the maintenance costs have been reduced more than 50 per cent.

Other Soft Spots Cured

The T.R.R.A. has treated locations other than special trackwork, where the unstable character of the roadbed has been the cause of abnormal maintenance costs. One such location is in Dupo, Ill., where 165 ft. of a wye is laid on a cinder fill overlying a very unstable blue clay. Even in dry weather, an average of 45 man-hours was required weekly in maintaining this stretch of track, and in wet seasons this amount of labor was almost doubled. Emergency work was also necessary here frequently, but since grouting, in July, 1943, this location has required only occasional surfacing.

At another location in Dupo, a 100-ft. stretch of curved track needed surfacing two or three times weekly. Ballast applied here to restore the surface worked its way down into the blue clay subgrade and reappeared at the surface 8 to 10 ft. away from the track. Grout was applied here more than two years ago, since which time only one day's work in resurfacing has been necessary.

A somewhat different method was used to stabilize about 200 ft. of double track at Kienlen Ave., west of the city limits on the outer belt line, where, under a traffic of 16 scheduled passenger trains and 6 or more freight trains daily, the track settled constantly out of line, presenting a serious problem. At this location the tracks are in a cut on a bed of blue clay, the underside of which rests on a sloping strata of rock. In an attempt to stabilize this piece of track, in 1942, 25-ft. timber poles were driven on 4-ft. centers at the outside ends of the ties in each track, and also longitudinally down through the center of the intertrack space. As a result, the necessity for general surfacing here every few days was reduced to about once a month.

After about a year, dissatisfied with the results being obtained, this piece of track was pressure grouted, using 1100 sacks of cement, and an intercepting ditch, 5 ft. deep, was dug along the track and filled with crushed slag to within 1 ft. of its top. Since the completion of this later work, the track here has required surfacing only at six-month intervals.

Equipment

Since most of the troublesome locations on the Terminal have been relatively small in extent, there has been no attempt to build up extensive or elaborate equipment to do the grouting work. In fact, the simple and effective equipment originally devised, with slight modifications, is still in use. This equipment consists essentially of a mixer, a pressure chamber, a discharge line and a number of drive and injection points. A 50-gal. drum, fitted with baffles and an air-motor-driven paddle shaft, is used for the mixer, and is mounted on a wooden platform high enough to permit it to discharge into the pressure chamber on the ground. The pressure chamber is a modified cement gun machine, the discharge line from which made from sections of 1¼-in. rubber hose, carries the grout to the injection points. The injection points, usually 42 in. long, are of 1-in. heavy iron pipe.

Several steps are followed in installing each injection point. A solid 1½-in. steel spud, or drive point, is first driven through a pinch plate into the ballast and subgrade to break a path for the injection point, and is then withdrawn by means of a claw bar inserted between the pinch plate and a tie plate laid on the ground.

Installing Injection Points

The injection point, tipped with a rivet to form a pilot plug, and thus prevent fouling of the point during driving, is then driven into the hole from which the spud was withdrawn. After the point has been driven to nearly its full length, the pilot plug is forced from the point by means of a 7-ft. length of ⅝-in. steel rod. This rod is driven beyond the lower end of the point, into the roadbed, to improve the opportunity for the grout to find its way into any porous areas. After the rod has been removed, an elbow is placed at the top of the injection point and the discharge line is connected to it.

The equipment is relatively light in weight and is transported easily with a motor car and trailer. The compressed air required in the work is usually taken from yard air lines, where available, but in the more outlying locations, where not available, the air supply is furnished by a small portable compressor.

A force consisting of a foreman, a machine operator, a mixer operator and three laborers performs all the work incidental to the grouting operations. These men developed excellent judgment in determining the proper locations of injection points, the control of the grout to avoid waste, and as to the advisability of additional injections to insure complete treatment.

Use Neat Grout

At the outset, grout consisting of various mixtures of cement, sand and water was experimented with, but considerable difficulty was experienced with plugged discharge lines, particularly at elbows and other connections. Later, it was decided to use

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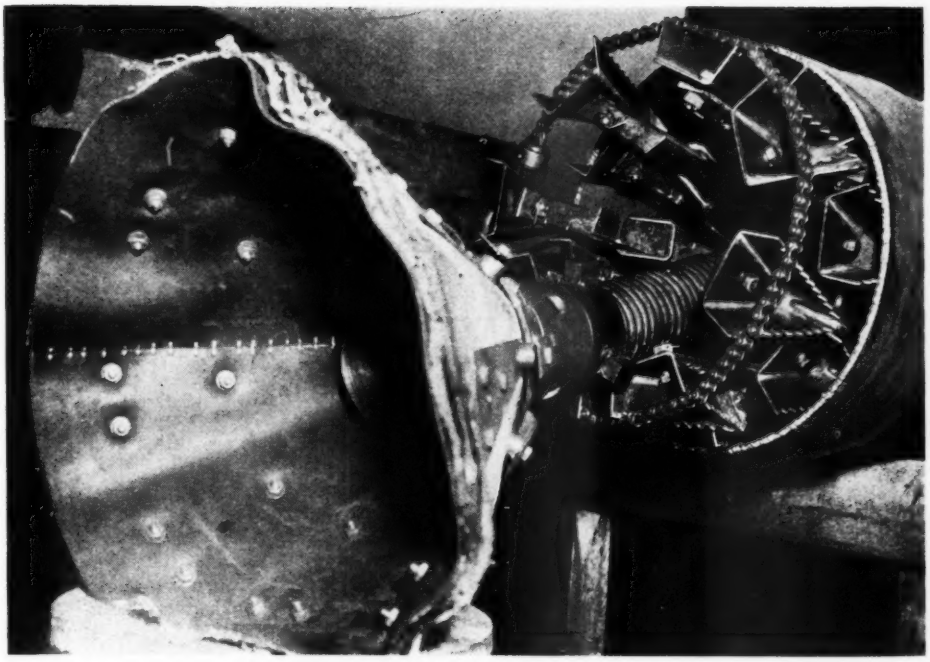


Type of Tool used in the Hydraulic Cleaning Method, As It Appears When Partially Inserted in a Pipe

Cleaning Water Mains Effects Large Savings On the C. B. & Q.

This article describes the methods used in cleaning 17½ miles of pipe lines on the Chicago, Burlington & Quincy during the last three years at 38 points. Several examples are given of the results secured, including faster delivery, lower pumping pressures, reduced pumping costs, and in some cases the salvaging of clogged lines which would otherwise have had to be replaced.

THE experience of the Chicago, Burlington & Quincy affords an excellent example of what can be accomplished by a systematic program of water main cleaning, both in increasing the efficiency in water delivery systems and in increased operating economy. During the years 1943-1945, inclusive, this road cleaned 93,789 ft. of water mains and, in addition, 27,739 ft. of sewers and drains.

Maintaining the carrying capacity of their water mains is one of the principal problems of the railways in meeting their demands for water. The age of the pipe is recognized as a factor in the carrying capacity of any line, but there are other factors of even greater importance—incrustation, tuberculation, organic growth, corrosion and sediment. Sometimes obstructions in the line, such as lumber, stones, lead and other objects are the principal causes of reduced flow.

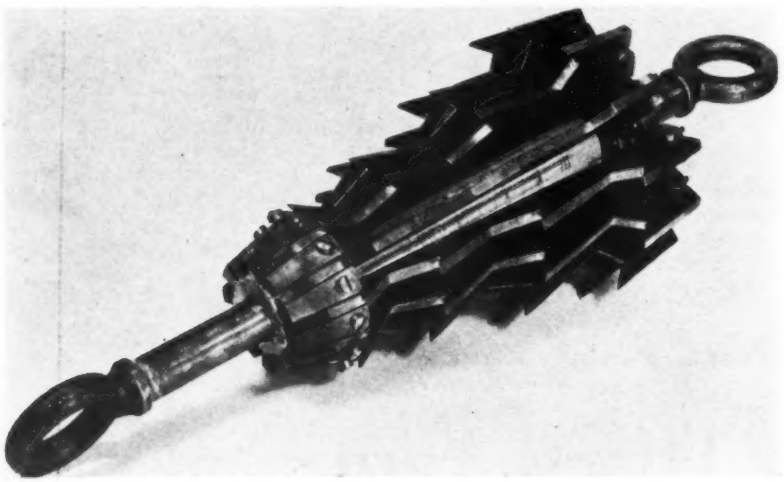
Where pipe lines were cleaned on the Burlington, adverse conditions within the lines were quite apparent, but in all cases these were checked by tests of the gravity flow from tanks to water columns or other facilities, or by determining the pump pressures required to deliver the water to the tanks. Where the flow through pipe lines from storage tanks was less than could be expected from the available head, or where pump pressures were excessive, restrictions of some kind were indicated in the lines. In most cases restrictions to flow were found to be caused by after-precipitation or by other deposits from treated water. In other cases valves were found to be partially closed, and the condition was corrected. In still other cases blocks of wood, pump valves, stones and other objects were found lodged in elbows and reducers, and at a few points pieces of lead were found, weighing up to 60 lb., this lead having flowed into the pipe through joints when the lines were laid.

Two methods of cleaning these lines have been used by the Burlington—the hydraulic method and the mechanical method—depending upon conditions. In general, however, the hydraulic method is confined to those lines where relatively soft deposits are encountered, while the mechanical method is used where hard cutting is involved.

In the hydraulic method, which is carried out in the direction of flow within the line, the cleaner consists of a series of specially designed plows which are forced through the pipe by the pressure of the water on a series of flexible cups fitting closely to the interior of the pipe. The plows are formed of hardened steel and are mounted on spring steel arms

which hold them against the interior wall of the pipe. They are arranged in series so that the cutting edges overlap, insuring their covering the entire area to be cleaned. Holes are provided in the cups to permit flushing out the cuttings ahead of the cleaning tools.

Employing this equipment, sections of pipe up to 4,500 ft. long were cleaned at single locations on the Burlington. In each instance, openings from 4 ft. to 8 ft. long were made in the pipe lines for the insertion of the hydraulic cutting tool, the number of cuts required being limited only by the number of elbows in the line. Where the water pressure was insufficient to force through the cutting tool, especially on short stretches of line, such as water column lines, the cups were removed and the cutting head was pulled through the pipe by a ½-in. cable which was first passed through the pipe by a light line, floated through by a carrier. Pulling through of the cutting head was done by means of a winch, the pressure of the water flowing through the pipe flushing out the cuttings as they were removed.



A Tool Used in the Mechanical Method of Cleaning Pipe Lines

Mechanical Method

Where heavy, hard deposits have been encountered on the Burlington, they have been removed by the mechanical method. This method is performed by rotating cutting tools through the line, driven by flexible spring-steel cables. The mechanical cutting tools differ from the hydraulic plows in that they act somewhat as a reamer. In this method of cleaning, which can be carried out continuously around bends up to 90 deg., operations are carried on against the water pressure, which washes out the cuttings behind the cleaning tool as it is passed through the pipe. Sections up to 250 ft. can be cleaned in one operation by this method, depending upon the character of the incrustation.

Joints of the Dresser type were used in closing the openings in all of the Burlington work, whether by the hydraulic or mechanical method, as it was found that the work could be done more quickly with a joint of this kind. In addition, this type joint provides a means of readily opening the pipe for future cleaning or examination. In all cases it has been necessary to take the lines out of service while they were being cleaned.

In the extensive program of pipe cleaning on the Burlington during the last three years, lines have been cleaned at 38 different points, in sizes from 4 in. to 14 in. The length of lines cleaned at various points has ranged from 145 ft. to 11,525 ft.

The character and thickness of the deposit varied with different pipe lines. In some cases it was relatively soft and could be removed readily by the hydraulic method, while in others it was necessary to use the mechanical cleaner, making two runs of the cleaning tool where the deposit was extremely hard. In one case where a 10-in. pipe was incrusted to the extent that the opening was reduced to about 2 in., it was necessary to make a preliminary center cut because the opening was too small to permit sufficient flow of water to flush the cuttings out of the pipe.

The results obtained by the Burlington in its pipe cleaning program have been highly successful in restoring the carrying capacity of its pipe lines to practically that of new lines. In turn, the speed of delivery of water to locomotives has been greatly increased; pumping pressures have been reduced, with a resultant saving in the cost of pumping; and in many cases the necessity for laying new water mains has been eliminated. A few examples will indicate the results accomplished.

At Galesburg, Ill., 4,500 ft. of 12-in pipe between the tie plant and yard tanks at that point were cleaned by the hydraulic method, removing several tons of relatively soft deposit and a trench shovel which had presumably found its way into the line when it was laid. This work reduced the pumping pressure by 7 lb., increased the delivery of water by 300,000 gal. daily, and is effecting a saving in electric current amounting to $4 a day. The actual time of cleaning this line after the cleaning tool was inserted and the water was turned on behind it was 22 min.

At Hudson, Colo., 150 ft. of 12-in. pipe from a supply tank to a water column were cleaned. In this work, in addition to removing the deposit from the line, which was 5 in. thick, an obstruction in the form of a strainer was found which was 11 in. in diameter and 13 in. long. Here, the delivery of water was increased from 877 gal. per min. to 2,500 gal. per min., and the time required for taking 10,000 gal. of water was decreased from 11½ min. to 4 min.

At Bridgeport, Neb., 1,110 ft. of 4-in. and 90 ft. of 6-in. fire lines, and 1,450 ft. of 8-in discharge line from a water treating plant, were cleaned, employing the mechanical method in the former and the hydraulic method in the latter. Here, a hard deposit 1 in. thick was found in the fire lines, together with a 3-in. by 12-in. piece of wood, which had lodged in a 4-in. by 6-in. reducer. A 2-in. deposit was removed from the 8-in. discharge line, along with three wooden plugs. It is estimated that about 6 tons of material were removed from this latter line. The pumping pressure, which was 45 lb. before cleaning, was reduced to 21 lb.

All cleaning in the Burlington's program was done under contract, at a previously agreed cost for each specific line cleaned, the contractor furnishing the equipment and a superintendent, and the railroad supplying the necessary force for opening and closing the lines and handling the equipment. About 85 per cent of the work was done by the Pittsburgh Pipe Cleaner Company, under the general direction of H. R. Clarke, chief engineer of the Burlington, and H. G. Dalton, engineer of structures. The actual work was done under the immediate direction of W. D. Gibson, assistant engineer.

Getting a Spark in Motor Cars

Part II

By G. R. WESTCOTT
Assistant Engineer
Missouri Pacific Lines
St. Louis, Mo.

No. 8 of a Series

This installment of the series on the selection, care and operation of track motor cars is the second section of a three-part article on ignition systems. Part II is devoted principally to storage battery and magneto ignition systems, including discussions of distributors and the several types of magnetos. Considerations involved in choosing an ignition system are also discussed. Part III will deal with the importance of good wiring, types of spark plugs and their care, and rules for maintaining ignition systems.

STORAGE or wet cell battery ignition is very well known because of its universal use on automobile engines. Its use on motor cars is not very common; however, wet cell batteries are sometimes provided for furnishing lights or for starting on cars with four-cycle, multiple-cylinder engines, and if so provided may also be used for ignition. The functioning of this type of ignition is similar to that of dry-cell ignition, but the equipment required differs in some important particulars. Here the source of the primary current is the familiar automotive type of battery. Instead of a spark coil with buzzer for interrupting the current, a plain coil is employed and the breaking of the current is done mechanically as one of the functions of the distributor. No timer is required, as the timing of the spark also is done by the distributor.

Like the dry cell battery, the wet cell battery is made up of cells, each of which is a unit in itself. Within each cell there are a number of plates arranged in two groups, one positive and one negative. The number of plates in the positive group is one less than the number in the negative group. Thus, in what is often called a 15-plate battery, there will be 7 positive plates and 8 negative plates in each cell. The positive plates are connected electrically together and to a positive terminal. Similarly, the negative plates are connected together and to a negative terminal. Within the cell, the positive and negative plates are arranged alternately with a separator of wood or other nonconducting material between each two plates. The plates are all of metallic material, but that in the positive plates differs from that in the negative plates. A solution of sulphuric acid and water, known as the electrolyte, surrounds both the plates and the separators.

Constructed as described, each cell has an average electrical pressure of 2 volts. To provide the 6-volt battery commonly used with a motor car engine, three such cells must be connected in series, that is, the negative terminal of cell No. 1 must be connected to the positive terminal of cell No. 2, and so on through the group of three cells. The positive terminal of cell No. 1 is then the positive terminal of the battery, and the negative terminal of cell No. 3 is the negative terminal of the battery. With the parts assembled as described the three cells are encased in a container usually of hard rubber.

While the average electrical pressure of each cell is 2 volts, it may run as high as 2.5 volts when the battery is fully charged, and may drop as low as 1.5 or 1.75 volts when the battery approaches complete discharge. This variation in voltage does not interfere with the use of the battery for ignition.

How They Work

The materials in the plates are such that when the electrolyte surrounds them a chemical action takes place, producing the electric current. Under this chemical action, the acid content is withdrawn from the electrolyte and unites with the material in the plates. When this has proceeded to a definite point, the battery will no longer produce a current. However, when a current from a generator or charger is passed into the battery, the original condition is restored. This type of battery, therefore, can correctly be termed a storage battery for it has the power to receive and store electrical force, and, at a later time, give it off.

The acid in the battery may be considered to represent the electrical power of the battery since it is in the electrolyte when the battery is charged and in the plates when it is discharged. The condition of the electrolyte as to its acid content may be taken, therefore, as a measure of the electric charge the battery contains. The specific gravity of pure sulphuric acid is 1.835 times that of water and the condition of the battery can, therefore, be determined by a hydrometer, a device by which the specific gravity of liquids can be measured.

When a battery is fully charged, the hydrometer reading will be about 1.280. When the reading drops as low as 1.150 the battery may be considered fully discharged; that is, the solution has then become weakened to a point where it is no longer capable of exciting the chemical action necessary to produce a current.

The discharge capacity of a battery depends on the number of plates per cell, their size, and other features of construction. It is measured in the number of ampere hours it will produce before the battery is exhausted to the lower limit of its usefulness without recharging. The number of ampere-hours capacity, however, depends on the rate at which the discharge takes place. For ignition use, the number of ampere-hours discharge in 20 hr. is a common method of rat-

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ing; for example, a 17-plate battery of good construction may be rated at "120 ampere-hours at 20 hours." For starting, or other rapid discharge, the capacity rating will be quite different; under these conditions, the same battery may be rated at "145 ampere-hours at 20 minutes." Ratings are based on performance at a temperature of 80 degrees F. The voltage drop will be greater where the rate of discharge is rapid. The battery described above, under a 20-hour discharge, would have a final voltage of about 1.75 volts per cell, while if discharged at the faster rate, the voltage would drop to about 1.5 volts.

Storage Battery of Type Used in Motor Cars

All chemical action develops some heat, and the water in the electrolyte will evaporate and must be replaced. Only distilled water should be used, otherwise impurities may be introduced that will interfere with the operation or shorten the life of the battery. The height of the electrolyte should be checked frequently and a depth of about 3/8 in. over the top of the plates maintained. Many batteries have a device built in to prevent over-filling. If there is no such device, care should be taken to avoid over-filling, as the overflow will carry away a part of the acid content of the electrolyte. Some room must be left for the expansion of the electrolyte as the battery warms up under chemical action.

The adding of water should be done just before the battery is used or charged rather than after, especially in winter weather. There is no danger of the freezing of the electrolyte in a well-charged battery but the newly added water, being much lighter, may remain on top of the electrolyte, and freeze if not mixed by chemical action in the cell. A battery approaching full discharge may freeze during severely cold weather, as indicated by the figures given in the following table:

Condition of Charge	Hydrometer Reading	Freezing Point
Fully charged	1.280	—85 deg. F.
One-half charged	1.225	—35 deg. F.
Discharged	1.150	+ 5 deg. F.

Replacing the Electrolyte

Ordinarily, nothing but distilled water should be added to the electrolyte, as the acid does not evaporate. The electrolyte may be spilled, however, and its replacement or readjustment may be necessary. If the battery is not worn out, this may be done, providing charging equipment, sulphuric acid solution of not over 1.345 specific gravity, and distilled water are at hand. The procedure is as follows:

First, fill the battery to normal level with distilled water and place on charge. Continue charging, with all cells gassing, until hydrometer readings show no rise in three hours charging. It may then be assumed that the acid is all in the electrolyte rather than in the plates.

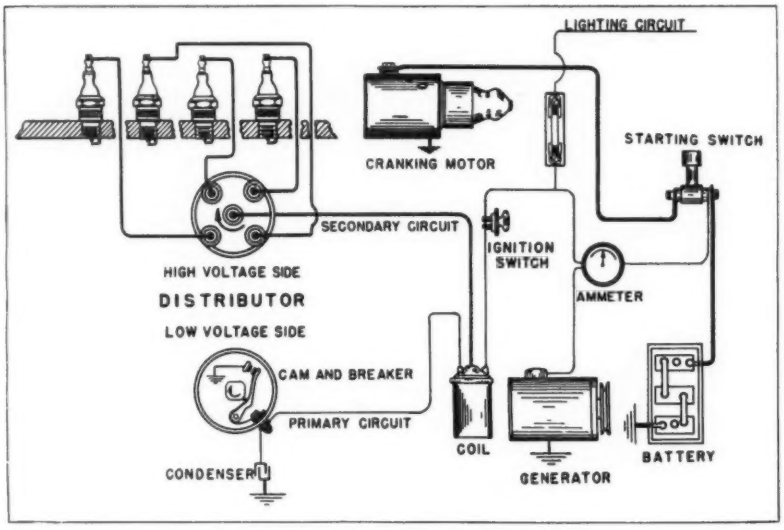
Second, withdraw some of the electrolyte from each cell and replace it at once with the sulphuric acid solution. The amount to be replaced will depend on the state of charge when the electrolyte was spilled, and of course, on the amount spilled.

Third, again charge for one hour, with all cells gassing. If the hydrometer reading is then 1.270 to 1.285 the electrolyte is properly adjusted. If reading is less than 1.270, repeat the process; or if more than 1.285, withdraw some of the electrolyte and replace it with water.

The hydrometer readings given are for electrolyte temperatures of 75 deg. to 80 deg. F. If the temperature of the solution is considerably over or under that figure, the temperature should be taken into consideration in making the adjustment. The correction to be made for temperatures above or below 80 deg. F., is one point on the hydrometer scale for each 3 deg. F. over or under 80 deg. F. and may be applied to either full charge or partial charge readings as illustrated below:

Temperature of Electrolyte	Full Charge Reading	One-half Charge Reading
116 deg. F	1.268	1.213
104 deg. F.	1.272	1.217
92 deg. F.	1.276	1.221
80 deg. F.	1.280	1.225
68 deg. F.	1.284	1.229
56 deg. F.	1.288	1.233
44 deg. F.	1.292	1.237
32 deg. F.	1.296	1.231

The top of a storage battery should be kept clean. If cleaning is required, water only should be used. Gasoline, kerosene or naptha should not be permitted to come in contact with the battery. The connections on the binding posts should be kept tight and free from the corrosion that will attack them if any of the acid electrolyte is spilled on them. To prevent such corrosion, they may be coated with cup grease. Whether in use, in storage, or being transported, the battery should always be kept in an upright position and fairly level. In use, it should be firmly fixed in its place.



Wiring Diagram for Four-Cycle Engines

The Distributor

A device peculiar to this type of ignition is the distributor. It performs three functions, all of which are co-ordinated, and except as modified to give the proper spark advance, are in step with the rotation of the engine. The first of these functions,

that of interrupting the primary current, is accomplished by the separation of a pair of breaker points. One of these points is fixed in position, while the other is mounted on a movable arm. A fiber rubbing block on this arm bears against a cam on the distributor shaft. The cam, in its rotation, moves the arm and thus separates the points and breaks the circuit. The spacing of the breaker points when the circuit is open should conform to the manufacturer's instructions. Adjustment of the gap is required occasionally to compensate for wear on the rubbing block.

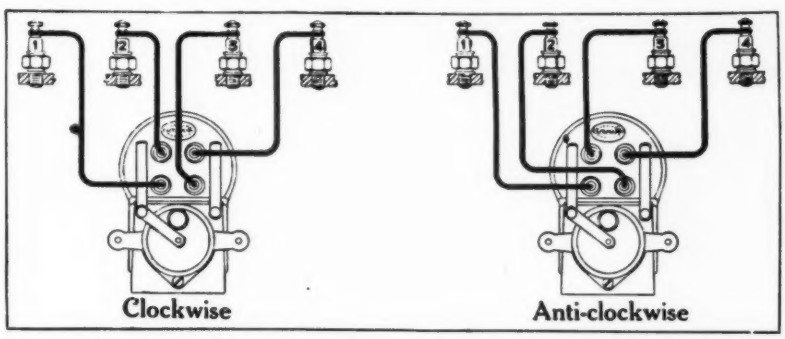
The breaker points are surfaced with tungsten to resist the heat of possible arcing. Several conditions may cause burning or pitting of the points. Improper condenser capacity has already been mentioned. A defective condenser, a condenser lead that is too long; or unusual resistance in the secondary circuit, such as corroded contact plates in the distributor head or too wide spark plug gaps, may also cause pitting. If there is only a slight roughness, the points may be smoothed up with a fine file or hone; but if the pitting is severe, renewal is the best remedy.

A second function of the distributor, that of distributing the secondary current to the various cylinders, is the one from which the device gets its name. From the coil, which is its immediate source, the high tension current is led into the distributor through the center of the distributor cap to a rotor mounted on the top of the distributor shaft. The wires from the spark plugs also enter the cap, terminating in contact plates on its inner surface. As the rotor revolves, it brushes over each of these contact plates in turn, thus completing the circuit to the spark plugs.

Accumulations of oil or moisture on the inside of the cap, or a crack in the cap into which moisture has entered, may divert the current from its intended path and weaken the spark in one or more cylinders. The inside of the cap, therefore, should be kept clean and dry. If it has become cracked, any moisture in the crack should be dried out and a coat of shellac applied to both the inside and outside surfaces. Such treatment should be considered a temporary remedy; but it may serve to keep the engine in service until a new cap can be secured.

The third function of the distributor is that of timing the spark. The cam actuating the breaker, and the rotor distributing the secondary current are positioned on the distributor shaft so that their functions are performed at the same time. Through the gears by which the timing of the valves are controlled, a definite relation is maintained between the rotation of the distributor shaft and the piston movement. As the breaker points and timing contacts are mounted in fixed positions in the housing, any required adjustment in the timing can be made by rotating the housing about the shaft. When the housing is rotated in the same direction as the rotation of the shaft, the relation of the parts will be changed to retard the spark; if rotated in the opposite direction, the spark will be advanced. Since the need for making such an adjustment may be required by the character of the fuel, the means of making it is sometimes called the octane selector. Economy of fuel and general good engine performance require that the spark be advanced as much as possible without producing a heavy spark knock. An unnecessarily retarded spark is not only wasteful of fuel and results in loss of power, but also causes the engine to heat.

To regulate the advance of the spark as the speed of the engine changes, it is necessary that a similar change be made in the position of the breaker points and timing contacts in relation to that of the shaft. Formerly, this was controlled manually, but on modern engines automatic control by means of a fly weight governor is common. Automatic regulation of timing may also be provided to meet changes in engine loads. This is actuated by changes in the vacuum in the intake manifold. A combination of centrifugal and vacuum regulation of the timing will meet the requirements of variations in both engine speeds and engine loads.



Wiring Diagram for Rotary Magneto on Four-Cylinder Engine Firing 1-2-4-3

Magneto Ignition

Early magnetos were of the low-tension type and produced a primary current similar to that secured from a battery. To develop a high-tension current suitable for ignition, it was necessary to use an induction coil and breaker, as in battery ignition. Such magnetos were ineffective unless operated at a fairly high speed, and battery current was required for starting. Where magnetos are now used, they are of the high-tension type, combining within themselves not only the means of generating the current, but also the induction coil and breaker necessary for stepping up its potential to that required for producing a spark, as well as the devices for distributing and timing the spark.

As the two-cycle engine is reversible, a magneto used with it must also be capable of operating in either direction. Such magnetos are available and used, but battery and spark coil ignition is much more common. This is perhaps because the operator is more familiar with the latter, and feels more secure in his belief that he will be able to make necessary adjustments or repairs.

With the four-cycle engine, the problem is somewhat different. Here a reversible magneto is not required and a magneto that will give dependable and trouble-free service is not difficult to secure. For single-cylinder engines, the flywheel-type, as used on outboard motors, is employed most commonly, while, on multiple-cylinder engines of two, four or six cylinders, rotary-type magnetos are used. Where the car is equipped with a generator and storage battery for operating a starter or furnishing lights, the same current can be utilized for ignition. However, even though electric lighting and starting equipment is provided, magneto ignition is often preferred since, with a reliable magneto, any interference with operation because of battery failure is avoided.

Fixed-Spark Rotary Magnetos

Rotary magnetos may be either of the fixed-spark or variable-spark type. The fixed-spark magneto can be adjusted to time the spark at various degrees of advance, but when so adjusted the amount of advance remains the same regardless of the speed of rotation. The amount of advance, measured in degrees of rotation, is generally set as called for by the in-

structions of the engine manufacturer, and will be correct for the speed for which it is set, for the compression ratio of the engine and average fuel conditions. The skilled mechanic may, however, vary from that setting for reasons that his experience has shown him to be good. As in other types of ignition, the advance should generally be as great as will give good performance without severe spark under heavy load.

Lacking a means of regulating the spark to the speed of the engine, this type of magneto calls for care in starting to avoid a kick-back. Usually magnetos of this type are used only on engines of rather low compression, unless an impulse coupling is provided to avoid hazard of personal injury in starting.

The impulse starter or, as more properly called, the impulse coupling, is a device in the magneto drive that permits the drive to run ahead of the magneto rotor a few degrees, meanwhile compressing a spring. Then the spring is automatically released and the rotor turns quickly to overtake the driving mechanism. By this means two things are accomplished; the spark is delayed until the piston is near top dead center, and, because the rotor is turning at an increased speed at the moment the spark is produced, a hotter spark results. When the engine is turning over rapidly, a flyweight mechanism cuts out the impulse device so that the spark is thereafter in normal advance.

In adjusting the timing on a magneto having an impulse coupling, care must be taken to avoid a false timing, as the action of the magneto drive is different when the engine is turned over slowly than when operating at normal speed. In this case the adjustable coupling in the drive must be loosened and the rotor turned until the impulse coupling snaps, and then turned back to the firing position.

The impulse starter is a safety device of considerable importance, besides increasing the probability that the engine will start when cranked. Its more general use is desirable.

Variable-Spark Magnetos

Some rotary magnetos are provided with manual control, by means of which the spark may be advanced or retarded as the speed of the engine demands. If skillfully used, this means of regulating the spark makes good timing of the spark possible at all engine speeds. Its effectiveness depends, however, on the judgment and care of the operator. Automatic control of the magneto spark operating in a manner similar to that on a distributor would be desirable in some engine applications, but the need for such a control on motor car engines is not great.

The conditions governing the adjustment of the spark on a variable-spark magneto are similar to those applying to the fixed-spark type. While impulse couplings are sometimes provided on variable-spark magnetos, there is obviously less need for them on this type since the spark can be retarded for starting.

In ordering certain parts such as breaker plates or impulse couplings for a rotary magneto, it is necessary to indicate the direction of rotation. When viewed from the driving end (not the breaker plate end), if the rotation is in the same direction as the hands of a clock it is said to be "clockwise" and if in the opposite direction, "anti-clockwise." These terms are sometimes abbreviated to "clw." and "aclw.", respectively.

Several Types of Magnetos Are Used on Motor Cars

Flywheel Magnetos

The flywheel magnetos used on some single-cylinder engines are of the fixed-spark type, and their design does not permit the use of an impulse starter. Such engines are usually rather small and often the cranking mechanism is such that the engine can be "spun" or turned over rapidly. The danger of its kicking back is, therefore, not so great as in the cranking of a larger engine. No provision is made for any adjustment of the spark as the magneto is built into the flywheel and the spark is given the amount of advance that the engine manufacturer considers consistent with the other features of the engine design.

Care of Magnetos

Proper lubrication, cleanliness and correct adjustment of the breaker points are the principal requirements in the care of a magneto. And in this case, proper lubrication means to oil sparingly, and especially to avoid permitting any oil to get on any parts other than those requiring lubrication. Oil on the breaker points will cause arcing and burning, and on the windings will tend to destroy the insulation.

There will be little trouble in keeping the magneto clean if it is kept free from oil and gasoline. If necessary, it may be washed with naptha or other cleaning fluid, but if that is done, it should be dried out thoroughly before being placed in service. If mounted where leakage of gasoline can reach it, a shield should be provided to protect it.

The breaker points should be kept clean and the gap set as recommended by the manufacturer. A fine file made for that purpose, or a hone, may be used for cleaning the points. Excessive filing or honing should be avoided for the points will pit and burn worse after such treatment.

The combination of dry cell battery, spark coil and timer is best adapted to use on two-cycle engines. Likewise for four-cycle engines, either a magneto, or storage battery, plain coil and distributor best meets the needs. Where battery ignition is used, however, there is no fundamental reason why the combinations described must be adhered to. With either type, any source of 6-volt current may be employed and such variations from the usual combinations are used. For example, where light inspection cars with two-cycle engines are required to run at night and are provided with a generator and a storage battery, the only change in the ignition is the use of primary current from the storage battery instead of from dry cells. In a few instances, too, small four-cycle engines have been provided with plain coil and distributor, and operated by current from a dry cell battery. The use of dry cell batteries for the larger four-cycle engines is, of course, impractical, as the capacity of such a battery is inadequate for the purpose.

Grouts Roadbed Under Special Trackwork

(Continued from page 740)

a neat grout consisting of one sack of cement to 6 to 10 gal. of water, and this type of grout has been used since with good results and minimum trouble from plugged lines.

Normally, about 10 min. are required to mix and deliver each batch of grout, consisting of 3 sacks of cement and 18 to 30 gal. of water. Thus it is possible to place as much as 900 to 1,000 gal. of grout in an eight-hour day.

On the whole, the results of grouting special trackwork on the T.R.R.A. have been highly satisfactory. At only two or three locations has it been necessary to return to inject additional grout. In these cases, failure to effect a satisfactory cure was due to the use of insufficient grout in the first treatment, rather than to any breakdown of the grout applied.

After the more serious conditions on the Terminal were corrected, grouting was discontinued in the latter part of 1943 because of the acute man-power shortage then existing. However, the work has been resumed with the aim of overcoming unstable conditions remaining at many points.

Thus far only one apparent disadvantage in the grouting of special trackwork on the Terminal has come to light. At certain of the crossings, the grouting appears to have caused a slight decrease in the cushioning effect of the ballast and subgrade, with a consequent increase in the batter and wear on crossing frogs.

The pressure grouting methods used on the T.R.R.A. were developed by N. J. Law, assistant bridge engineer, and C. G. Parrish, general roadmaster, under the general direction of Col. H. Austill, chief engineer.

Personal Injuries Can Be Reduced

(Continued from page 737)

immediately to prevent the possibility of loss of time because of infection. In many cases, by doing this, the severity of the injury is lessened.

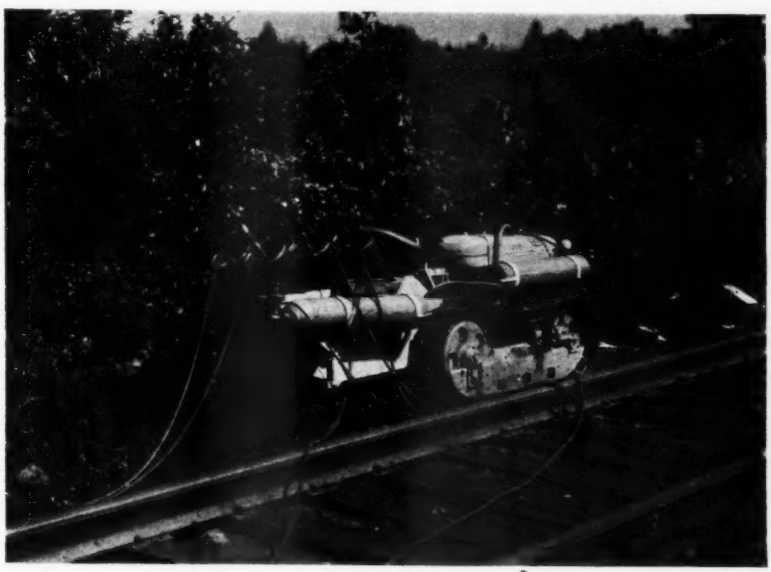
Claim agents play an important part in handling personal injuries and they are quite helpful in the efforts which have been described. Care should be exercised to see that the claim agent is informed fully in each case.

An extraordinary effort has been made on our road to reduce the number of motor-car accidents, but without satisfactory results. We all know that the motor-car operator who makes certain his car is in good condition, who tests his brakes when starting out, fills his gas tank when coming in at the end of the working period, keeps all unnecessary material off his car, and makes sure of line-ups and that his men understand them, is using his intelligence and should not get into trouble. Particular emphasis is placed on the careful and safe operation of motor cars, but we continue to have accidents. We hope that through eternal vigilance, insistence upon strict observance of safety rules and use of ingenuity in keeping everyone safety minded, to stop motor car accidents altogether.

"To be successful, safety educational work must come down from the top. It must be preceded by an indication of the management's responsibility and willingness to do its part in providing safe working conditions and safe tools and equipment, thus removing hazards at their source."

We on the Illinois Central consider our safety job a continuous one. The first step is to begin the job the right way. There is only one right way and that is the safe and efficient way. After the job is started, our first and most important objective is to find and correct the unsafe acts or habits that develop. Habit develops as a gradual process and it requires constant vigilance to prevent its development. We must train ourselves to see what we are looking at, and then to take immediate steps to correct any unsafe acts and unsafe conditions we see. Corrective action should never be deferred. The first time an individual sees an unsafe condition or practice he is aware of something being wrong, but if he does not take corrective steps immediately, each time he passes by the same hazard the danger will be minimized in his mind until he ceases to consider it a hazard. If housekeeping is allowed to deterioriate, if men are not given full instructions in the safe performance of their jobs and are not checked constantly on methods of performance, injuries will result inevitably.

At times there is too much of a tendency to handle safety by itself—as separate and apart from the job. As a matter of fact, true safety is the very core of the ordinary day-by-day elements of railroad maintenance and operation. We believe we are making progress in teaching this principle. Of the 101 supervisors of track, bridges, water service and signals on the Illinois Central, 63 passed through the entire year of 1945 without a reportable casualty to a worker under their supervision.



Tractor with Trailer Aids Rail-End Welding

By using a Cletrac Model GH crawler tractor with a caster-wheel-mounted trailer to haul the gas cylinders direct to their point of use, the New York, New Haven & Hartford has simplified and speeded up the work of building up rail ends by gas welding. The outfit is devised to carry enough gas tanks for a day's supply for three welders, with six acetylene gas tanks on the trailer and a tank of oxygen mounted on each side of both the trailer and the tractor. The gas in the acetylene tanks is preheated by pipes connected to the exhaust outlet on the tractor. An electric generator may be mounted in the back of the trailer to power three grinders used in grinding the welds.

What's the ANSWER?

How Small a Rail Gang?

How small can a mechanized rail gang be and yet produce effective results? What power equipment should be assigned? How should the gang be organized? Does the weight of the rail make any difference? What other factors require consideration?

18 to 20 Men Economical

By J. P. Datesman

Drainage Engineer, Chicago & North Western, Chicago

Small rail gangs of 18 to 20 men can be used economically for laying short stretches of rail on secondary or branch lines where traffic is relatively light. Spike drivers, bolt tighteners and adzing machines, all power-driven, can be used to advantage by such a gang. In many cases, the amount of rail laid per man-hour will exceed that of larger organizations. This fact has caused some misconception of the relative merits of large and small gangs for laying rail.

Generally, a higher degree of efficiency can be obtained from medium-sized rail or surfacing gangs that are fully mechanized, and work can be performed on tracks that are in or out of service. The gang can be balanced to function effectively and still have the several units reasonably close together, so that cut-ins can be made with minimum delay to traffic and the progress of the gang. Close supervision can be given to a medium-sized gang, which comprises a factor that results in a larger output per man-hour.

Many factors must be considered in connection with large rail renewals, such as delays to traffic during the actual relaying and those resulting from slow orders that may be necessary to protect the new rail until the surfacing is completed. The time limit involved on large projects is important, since all new rail should be protected by spot or out-of-face surfacing as quickly as possible to insure against surface bending. The actual cost per mile, based on track-feet laid per hour, is an important item to be considered. A medium-sized rail gang, fully mechanized, which can reasonably meet all requirements, can be composed as follows: 1 foreman, 1 assistant foreman, 1 welder, 1 welder helper, 16 machine operators and 28 laborers.

This gang should have the following power machines and tools: 2 bolt tighteners, 1 spike puller, 2 adzers, 1 rail crane, 1 grinder, 2 spike drivers, 1 heavy-duty motor car, two 25-man trailers and 3 push cars.

The men would be assigned as follows: 1 man removing anti-creepers and bond wires, 1 man removing nuts with a bolt tightener, 1 man assisting, 1 welder cutting bolts, 1 helper handling welding gas tanks on push car, 3 machine operators pulling spikes, 2 men removing joint bars and joint spikes, 2 men barring out rail, 2 men placing tie plugs and driving spike stubs, 2 machine operators adzing ties, 2 men assisting, 2 men painting adzed ties, 2 men placing tie-plates, 3 men handling new rail, 1 crane operator setting in rail, 1 operator grinding adzer bits, 1 man oiling rail ends, 2 men placing joint bars and bolts, 1 operator tightening bolts, 1 laborer assisting, 1 man distributing spikes and anti-creepers with push car, 1 man with a gaging tool, 3 operators and 1 spike driver driving gage spikes, 1 man nipping ties, 3 operators with 1 spike driver spiking, 1 man driving spikes at joints, 1 man placing anti-creepers, 1 motor-car operator, 1 foreman, 1 assistant foreman.

Such a gang should average 6,800 lin. ft. of rail or 3,400 track feet per ten-hour day, equal to 7.08 track feet per man-hour. The weight of the rail is an important item with a small gang

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Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered In September

1. *On multiple track, should rail be laid with or against traffic? Why? Does the diversion of traffic around the rail gang make any difference?*

2. *What are the relative merits of stationary and revolving ventilators for railway buildings? Where can each type be used most effectively?*

3. *Under what conditions, if any, is it desirable to clean ballast by hand? To what extent can this be done? Does this include the cribs? What disposition should be made of the screened-out material?*

4. *How does one construct staging for work below the deck of an open-deck trestle? A ballast-deck trestle? What precautions should be observed?*

5. *How much time is a section foreman warranted in devoting to the maintenance of anti-creepers? Why? Where difficulty is encountered in holding the rail as desired what should be done?*

6. *When constructing a settling basin, how much time should be allowed for clarifying muddy water? Should provision be made for using a coagulant? Why? What should be the capacity of the clear-water basin in relation to water consumption?*

7. *Where should gage rods be applied? Why? What are the advantages? The disadvantages?*

8. *Under what conditions is it economical to apply stucco to old station buildings? To other buildings? Is it desirable? Why?*

that is not equipped with a rail crane, but should make no difference where a rail crane is assigned.

Will Consist of 40 Men

By J. L. Leonard
General Roadmaster and Safety Supervisor, Erie, Youngstown, Ohio

It is assumed that the rail is to be laid under traffic by hand; that it is the 131-lb. section, releasing 110-lb. rail; and that all fastenings have been distributed in advance. This difference in weight will necessitate the replacement of the tie plates. The organization will consist of 38 trackmen, 1 welder, 1 welding helper and 2 or 3 foremen, using the following equipment: 1 bolt tightener, 1 adzing machine, 1 crawler-mounted air compressor, 2 pneumatic wrenches and 2 spike drivers.

The specific duties of the men and the sequence of their operations will be as follows: 6 men pulling spikes and removing anti-creepers; 2 men with bolt tightener removing bolts; 1 welder and 1 helper cutting bolts that machines cannot remove—they will also build up rail ends for making closures; 2 men rolling out old rail with rail forks; 1 man removing old tie plates; 1 man driving down spike stubs; 2 men applying and driving tie plugs; 2 men operating adzing machine; 1 man applying creosote to adzed ties; 1 man installing new tie plates; and 20 men setting in new rail.

As much old rail will be removed and new rail set in as it is estimated can be connected up prior to the arrival of the next train. After this has been done, the entire organization, except the men pulling spikes, will go back to apply joint bars and bolts, to gage and spike the rail and to apply anti-creepers, using for these purposes 1 joint-bar clamp, 2 pneumatic wrenches and 2 pneumatic spike drivers. If an air compressor is not available, engine-driven track wrenches and spike drivers may be used.

If lighter rail is being installed, fewer men will be needed for setting in the rail. This number cannot be reduced below 14, however, and still have enough force to man the equipment and close the track quickly for traffic. Based on seven hours of actual rail laying, and assuming that it is necessary to close for seven trains, the foregoing organization will lay and couple 18 rails an hour, or 4,914 lin. ft. of rail per day. If tie conditions are such that unusually heavy adzing is necessary, an additional adzing machine and two additional trackmen may be required to maintain the effectiveness of the remaining equipment and thus keep all of the men busy.

While fewer men can be used in a mechanized rail gang by changing their duties slightly, such as bringing back the men who are pulling spikes to help couple the rail, we have found that such an organization does not prove to be economical.

Recommends 75 Men

By B. Z. Meers
Supervisor of Track, Southern, Oakdale, Tenn.

Assuming that all material has been distributed in advance and that the rail is to be laid under traffic, the smallest effective gang will consist of not less than 75 men, 1 foreman, and 2 assistant foremen, equipped with the following power machines and tools: 2 spike pullers, 2 bolt tighteners, 2 adzing machines, 1 cribbing machine, 1 creosote sprayer, 1 rail crane or power-driven rail layer, 1 air compressor and 4 pneumatic spike drivers.

The gang should be organized as follows: 2 flagmen, 2 men with bolt tightener removing joint bars; 1 man removing anti-creepers, 6 men operating spike pullers, 2 men pulling spikes missed by spike-pullers, 3 men barring out old rail, 1 man removing old tie plates, 6 men plugging spike holes, 2 men with cribbing machine, 2 men driving spike stubs, 4 men with adzing machines, 1 man changing adzer bits, 2 men operating creosote spray, 2 men applying tie plates, 1 crane operator, 2 men guilding new rail to place, 1 man hooking rail and placing rail shims (if power rail layer is employed instead of rail crane, 4 additional men will be needed), 6 men gaging ahead of rail crane, 2 men applying joints with plastic joint lubricant, 2 men operating bolt tightener, 6 men completing gaging, 8 men to straighten tie plates and set spikes for spike drivers, 1 man operating air compressor, 4 men driving spikes with spike drivers, 1 man removing rail shims, 2 men applying anti-creepers, 2 water boys, 1 man with push car with supply of extra tools.

The weight of the rail makes so little difference that it does not affect production. Local conditions will require consideration, however, and may affect production more than the weight of the rail. When closure has been made to allow trains to pass, the entire gang can be turned back temporarily to stack released material or to do other work.

Segregation of Aggregates

To what extent can the segregation of the larger particles in stone and gravel be prevented when stocking these materials for concrete construction? How can this be done?

Have Little Difficulty

By J. B. Schaub
Assistant Engineer of Buildings, Illinois Central, Chicago

We experience little difficulty of this nature. Coarse-material-segregation problems arise where large quantities of aggregates are handled and stored. Most of our concrete work consists of relatively small units, such as building foundations, footings, piers, etc. Again, most of our work of this character is handled by contract, and the contractors obtain their aggregates from the nearest source.

In our work, either premixing or mixing on the job is permitted. We require, however, that frequent tests be made to determine the relative proportions of fine and coarse aggregates. If the proportions are so irregular as to make it impracticable to obtain a correctly-proportioned concrete, they must be screened and reproportioned.

If the aggregates are cleaned thoroughly of clay, fine sand and other undesirable materials, little difficulty should be experienced from segregation of the larger particles. If this does occur, suitable regrading and mixing of the aggregates becomes vital.

When in piles, if removal is made with hand shovels from the base of the pile, the large particles tend to roll to the foot and edge of the pile. In this situation, care must be exercised to insure that the smaller material at the foot of the pile is picked up in turn rather than allowed to accumulate inside the continually forming ring of larger particles.

When handling and piling graded aggregates that are to be mixed on the job, the several grades should be kept separate by using bins, dividing walls or gaps between piles. When dumping materials, by either bucket or truck, it is natural for a cone to form. The larger material then rolls

to the perimeter at the base. If additional dumps are made at the apex of the cone, there is a tendency for more of the larger particles to collect at the base. Care in making the dumps to avoid cone formation will reduce segregation.

Spread in Layers

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

If stone or gravel aggregates are stocked by means of belt conveyors, the discharge end of the conveyor should be able to move up, down and sidewise in such a way that the pile can be built up in layers not more than 2 ft. high, provided the stock pile is in the open. If this is done there should be practically no segregation of the large and small particles. If the conveyor system does not possess a movable discharge end, a bulldozer should be used for pushing to the point of loading when the stock pile is loaded out. This will remix the aggregate to some extent. If, however, the stone or gravel is to be stored in bins, the conveyor should have a discharge end that will permit lateral movement to such an extent that the material can be spread in layers not more than one foot thick.

Where the aggregate comes in cars that are unloaded with clam-shell buckets into open stock piles, the crane should place it by single bucket loads over the entire area to be occupied rather than to drop it at one point and allow it to build up as a constantly expanding cone. Succeeding increments of the pile should then be built up in the same way. This will prevent appreciable separation of the fines from the coarse particles. Where the cars are unloaded in bins, the bins should be filled as before by building up one-foot layers.

Where the stocking is done in the open from trucks, the trucks should dump over the entire area to be occupied, and continue this progressively as the pile is built up. If the area is too small to allow spreading in layers not more than one dumping in thickness, a bulldozer should be used to remix the aggregate as it is loaded out.

Why Do Crossties Split?

What causes ties to split? Is this tendency more pronounced in some woods than in others? Why? Is it affected by traffic? What measures can be employed to overcome it?

Occurs in Two Cycles

By F. G. Campbell
Assistant Chief Engineer, Elgin, Joliet & Eastern, Joliet, Ill.

Splitting of ties occurs during the two distinct cycles of tie life. In the first, splitting occurs during the seasoning period, and is caused by uneven elimination of the water content that is diffused throughout the body of the tie. Because of the character of the cell structure in the oaks, these woods are much more subject to splitting while seasoning than other woods are. Ties cut from oak trees that have grown on low swampy ground are much more susceptible to splitting than ties that have been cut from upland oak. This is because the swamp oak has the higher water content.

Painting the ends of ties to retard the elimination of moisture through the ends has been advocated, and is sometimes effective in the prevention of splitting. Probably the most effective method for preventing splitting during the seasoning period is the application of anti-splitting irons to the ends of the ties.

There are several types of these irons in general use, and all are more or less effective. To be of the greatest benefit, however, they should be applied at the first indication that splitting is about to occur. On the other hand, this is not always practical and anti-splitting irons are helpful if driven into the ends of the ties after they are cut and before the split has become too wide.

After the split has become too pronounced to be retarded by the application of anti-splitting irons, the tie may be pressed together and held by dowels or bands. This procedure may be classed more properly, however, as restoration rather than prevention.

The second cycle of tie splitting occurs after the tie has been installed in the track. Here also splitting is more likely to occur in oak ties than in those of other woods. It is also quite probable that some of this splitting is caused by further drying out over that which occurred during the normal seasoning period. This is indicated by the fact that some ties split in the track, which have shown no indication of splitting while seasoning.

On the other hand, most of the ties that split in the track started to split while seasoning. Improper spiking or spiking while the ties are frozen may cause splitting. Creeping rail will cause ties to split, especially those at joints that are slot-spiked. Other than through the results of creeping rail, traffic appears to have little effect on tie splitting.

Splitting after the ties are in the track can be prevented, or at least reduced, by careful installation, especially in the matter of spiking. Correct application and later maintenance of anti-creepers to prevent rail creepage will reduce the amount of tie splitting. Probably the greatest benefit is obtained through the application of anti-splitting irons before the ties are inserted in the track, which, in many cases, will prevent the further splitting of ties in which small splits have developed while seasoning. I also believe that the application of these devices in all oak ties, regardless of whether any splitting has developed while seasoning, is a practice that is economically justified.

Preboring Ties Helps

By David D. Housenga
Section Foreman, Chicago & North Western, East Clinton, Ill.

It is my experience that prebored ties are less likely to split after they are in the track than ties that have not been bored. I believe, therefore, that much of the trouble that occurs from splitting after the ties are inserted can be eliminated by a complete program of preboring. Furthermore, where the ties are prebored, the preservative gets into the wood fibres around the spike holes and is retained in sufficient quantities to retard decay, which is also an important factor, in connection with gaging and spike lining, in hastening failure of the ties.

No Wood Free From It

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

This is an old subject that is ever new, for, despite our best efforts and the knowledge accumulated through many years of experience, we have developed no means of prevention that goes back to and removes or overcomes the cause or causes of the trouble. To be sure, we are preventing the incidence of splitting in ties, but we are doing it by mechanical methods that bear no relation to the cause. It does seem, however, that some one might develop a method

that can be used to minimize the splitting of ties by attacking the trouble at its source.

Obviously, loss of water from the cells of the wood during the process of seasoning is one of the important causes of tie splitting, although it is not altogether clear why some woods, as the oaks, are subject to this trouble to an extreme while others are considerably less affected and still others are almost if not entirely immune. Then after the ties are in the track they are subject not only to weathering, but to alternate wetting and drying, which may be particularly severe in dirty ballast, all of which cannot fail to have some effect on the occurrence of splits.

Although most authorities say either that traffic is not a cause of tie splitting or they assign it a minor role as a cause, I am convinced that it is of greater importance than is generally believed. In part this is demonstrated by the fact that short ties, say 8-ft. ties, tend more to split after they have been inserted in the track than longer ties do. Yet there is nothing among the causes of splitting that operate on the ties before they are inserted to which this difference can be attributed.

At present, the only means of prevention that are effective are to drive anti-splitting irons into the ends of the ties. Since these have proved effective to a considerable extent, provided they are applied before splitting occurs or immediately after it begins, before seasoning has started or has progressed, as the case may be, I have no suggestions other than to continue this practice for the present. I am in hope, however, that some day someone will find a way to end the tendency to split without causing harm to the timber.

Camber in Pipe Culverts

Is there any advantage in providing camber in pipe culverts when they are installed? Why? If so, how much? Are there disadvantages? Can this be done where they are jacked into place? How?

If Settlement May Occur

By A. R. Harris
Assistant Engineer of Bridges, Chicago & North Western, Chicago

Although concrete pipe is rigid and is considered to have sufficient inherent strength to carry superimposed loads without developing passive pressure on the sides, it is likely that a concrete pipe culvert will develop cracks in the top and bottom surfaces and not be satisfactory unless the filling material is compacted all around the pipe, and the details of the installation are such that the filling will remain tight against the pipe.

If the joints are not tight and the filling material seeps up through the joints at the bottom of the pipe, the sides of the rigid pipe will not move out immediately to remain in contact with the filling material, as might occur with a flexible pipe. The loss of filling material may be accelerated and voids formed around the bottom of the pipe. Concrete pipe, especially green concrete pipe, is subject to plastic flow of the concrete and in time deformation will occur and cracks develop under smaller superimposed loads than is indicated by short-time test loadings.

For these reasons, where there is a possibility of subsidence of the culvert, as in case of new fills placed on natural ground where settlement is likely to occur, camber should be provided in sufficient amount so that a straight and uniform grade line will result eventually, without sag to detract from the effective water-carrying capacity of the culvert. Then the joints will be uniform and tight, provided no movement of the pipes laterally has occurred. The disadvantage of providing camber is that the joints will not close tight when the culvert is installed. Consequently, camber should be provided only in those cases where the soil data are adequate to allow dependable computation of the amount of camber necessary.

Camber can be provided in culverts that are jacked through fills by placing wooden shims at the top of the excavation as the jacking progresses, so as to divert the pipe downward. The success of this method will depend largely, however, on the experience of the foreman handling the job.

Usually Guesswork

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

Putting camber in a pipe culvert is largely a matter of guesswork with respect to the amount of settlement that can be expected under the middle of the roadbed. If the supporting ground is unyielding, the camber will remain in the culvert, causing a certain amount of the drainage on the upstream side of the culvert to back up. If the ground is yielding, the camber given the culvert may not be enough. If increased to correspond for what is believed to be badly yielding ground, there may be a pool of water upstream that, through seepage, might weaken the supporting ground on the upstream end of the culvert.

Where the roadbed is expected to settle, it is good practice to support the pipe on substantial foundations, usually made up of good sections of T-rails or of creosoted timbers.

If small pipe culverts are installed by means of a boring machine and are jacked into place, the culvert cannot well be given a camber. However, if the pipe is large enough to allow a heading to be dug ahead of the pipe, there is no reason why the heading cannot be dug crooked and the pipe guided by suitable slides in the top of the hole where the pipe is to be turned downward. It appears that there are few, if any, fills, however, that would justify such procedure.

Sees No Good Reason

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

There are a number of conditions under which pipe culverts are installed, any of which may affect the performance of the structures. If the pipe is laid in an open trench through a well-established and thoroughly-settled and compacted roadbed, there should be no settlement and I can see no reason for placing camber in the pipe. However, the trench in which the pipe is laid should be excavated to conform to the curved perimeter of the pipe, and when the trench is backfilled, the backfilling should be tamped thoroughly on the sides and over the pipe to the full depth of the trench.

Where pipes are installed, say, to permit the filling of a trestle or other opening, particularly where the ground is not sufficiently firm to hold the pipe to the established grade or line, the trench should be excavated 18 in. to 2 ft. below the grade line, and a timber grillage should be laid, with a cushion of sand 12 to 18 in. deep for bedding the pipe. The grillage should be twice the diameter of the pipe in width. The pipe should then be covered with a good quality of earth which has been well tamped both on the sides and to a depth of two feet over the top, before the filling of the bridge is allowed to start.

It is practically impossible to determine how much a pipe will yield under a fill, because of the plasticity or lack of plasticity of the bearing soil and the kind of earth that is used for covering it. Timber grillages or cushions are not needed at all places where pipe culverts are installed. Where the pipes are laid on sand, gravel or hard clay, cushions are not necessary, since the pipe will hold both line and grade if the excavation of the trench has been carried out as it should be. Most often, signs of bending on top are found in pipes that are placed to permit the filling of bridges, and this results primarily because the tamping is neglected as the embankment material is placed in the trench and over the pipe.

I can see no good reason for placing camber in pipes when they are jacked through embankments, since this is done almost invariably through thoroughly-compacted material. A recent inspection of a considerable number of pipes jacked through embankments over a period of 20 years disclosed no case in which the pipe was out of grade or alinement.

Finishing Station Floors

What finish should be given wooden floors in passenger stations? Why? Does the kind of wood or the importance of the station make any difference? Why?

Recommends Oiling

By H. C. Lorenz

Assistant Engineer, New York Central, Cincinnati, Ohio

Oil makes the most desirable finish for a wooden floor and should, therefore, be employed in finishing floors of both softwoods and hardwoods in passenger stations, although a floor so finished must be gone over frequently. One effect of the oil is to darken considerably the natural color of the wood.

For a floor oil, use three parts of pure boiled linseed oil to one part of turpentine. If the boiled oil cannot be obtained, use four parts of raw linseed oil, one part of turpentine and one part of drier. This should be stirred frequently during the period of application, and should be rubbed well into the wood. All surplus oil, not absorbed by the wood, should be cleaned off the floor.

For floors that are not subjected to too severe usage, as in small stations, waxing, varnishing or staining makes a handsome finish.

Depends on Kind of Wood

By L. G. Byrd

Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

What finish should be applied to wooden floors will depend largely on the kind of wood used in the floor, and on the location and importance of the station. Yellow pine is used most widely as flooring for small stations, and in many instances with no finish, being left as laid. If a finish is desired on new or flat-grained pine, two coats of orange shellac make a lasting and satisfactory finish. However, the first coat should be sandpapered lightly after it has dried in preparation for the second coat.

I do not recommend any finish for floors of passenger stations in towns having a population of less than 1,000, since most such communities are without pavement or sidewalks. Floors that are tracked with mud, sand or other dirt, will soon be cut and marred until they will present a worse appearance than if they had been left unfinished. Such floors can be cleaned only by the vigorous application of soap and water, which will remove the finish as well as the stains.

Another finish that is cheaper than varnish or shellac, but not as satisfactory, is a three-coat application of linseed oil, to either yellow pine or maple. For this, the oil should be heated almost to the boiling point and applied while hot.

If the floor is of oak, a paste filler should be applied and rubbed off, and this should be followed by two coats of liquid filler, if color is desired. This finish requires a coat of wax, which should be applied as soon as the second coat is dry. This finish requires frequent applications of wax. A finish that is less difficult to maintain can be obtained by following the paste filler with two coats of high-grade varnish, leaving out the liquid filler. If a filler is not needed, the priming coat should be a good grade of shellac as this will not stain or darken the wood as varnish will. Pecan wood is permissible for station floors in some localities. It is a hardwood and should be given the same finish as oak.

Ground-Water Table Recedes

In what ways and to what extent has the present recession of the ground-water table over wide areas affected water supply? What must be done to overcome the trouble?

Has Had Wide Effect

By Arthur M. Buswell

Chief, State Water Survey Division, Urbana, Ill.

In Illinois, ground-water recession has necessitated the lowering of pumps by as much as several hundred feet, in some cases, in the industrial areas of Chicago and Joliet. In Champaign-Urbana, the use of water has had to be restricted and a large additional supply will be required within the next one or two years. In the important industrial areas around Peoria, Pekin and East St. Louis, the use of ground water for industrial purposes is being watched carefully and measures are being taken to conserve the supply.

As remedial measures I would suggest (1) that in any given area accurate measurement of ground-water levels and ground-water consumption be instituted at once, provided no such program has already been undertaken; (2) that wasteful use of ground water be eliminated; (3) that devices for the substitution of surface water for ground water be studied; and (4) that artificial recharge of ground water, which is feasible in many areas, be undertaken.

Cause Easily Explained

By Water Engineer

Probably no phenomenon connected with water supply is more disturbing than the recession of the ground-water level which has occurred or is occurring over wide areas of this country. While it is more aggravated in large industrial and irrigation areas, it is not confined to these areas alone, for it is also apparent far from large centers, sometimes even in more or less isolated areas.

In the larger centers this can be accounted for by continued use of

large quantities of ground water by industries and the smaller cities. The larger cities long ago outgrew the ground-water resources and rely entirely on surface supplies. Many of the smaller towns cannot afford the expense necessary to provide an adequate surface supply and must continue to draw on ground water as long as it remains available.

Irrigation pumping has exhausted the supply of ground water in some localities. Along the Pacific coast the water table has been lowered by irrigation pumping to such an extent that sea water has infiltrated into many areas far from the shore line. In fact, it was such a situation in the Central Valley of California that justified the building of the massive dam across the Sacramento river above Redding. A similar situation in Southern California was an important factor in the authorization of the Los Angeles aqueduct leading from the Colorado river.

In many areas where there has been no unusual draft on the ground water, the table is receding because the surface drainage of swamps and tillable land has prevented seepage into the ground of water that does fall onto the surface. While the recession here is generally less than where consumption is large, the eventual result will be the same—failure of the ground water.

No railway is in position to take such action as will be necessary to restore the ground water to its original level. This is a project of such magnitude, and one that requires a wider authority than any railway possesses, while it calls for such sweeping action that it can be accomplished only by state or federal government. On the other hand, the simplest and best solution, so far as any railway is concerned, is for it to search out and obtain adequate surface supplies. In many cases the necessity for doing this is closer than railway officers appreciate. In not a few instances action should be taken to insure against later inability to obtain needed supplies that are available now but may not be in a relatively short time.

Assigning Repaired Motor Cars

When a motor car has been repaired, should it be returned to the gang that sent it in? Why? If not, what disposition should be made of it?

Make Assignment Permanent

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

Practically all section and bridge foremen, and others who use motor cars regularly, become familiar with the cars they have been operating for months or years. They become acquainted with its weak points and familiar with its eccentricities, and know how to correct its minor defects. They also become attached to their cars, the same as an individual becomes attached to his automobile. When it becomes necessary for any reason to ship the car to the shop, they usually express the hope that they will get the car back.

In general, we try to keep the car with the same section or bridge gang, and when the car is worn out or damaged beyond repair, we ship a new car to the gang. Foremen and others will almost invariably take better care of cars with which they are satisfied and familiar than those with which they are not. Furthermore, it is much easier to keep the records in the division offices straight with respect to the location of the cars and who is in charge.

To keep repairs to the minimum requires close inspection by the operator, as well as by the division repairman. Both should be familiar with every working part and should know the names as well as the requirements of these parts. Bolts should be kept well tightened. Stop tests should be made at the start of each trip to know that the brakes are adjusted and in working order. Lubrication should be checked and applied when needed. Division repairmen should check with each operator to insure that he understands the operation of the car and the names of the parts. When a new operator is assigned the repairman should be with him for a day or two to familiarize him with the car.

Does Not Return Car

By C. H. Ordas
Supervisor Motor Cars, Chicago, Milwaukee, St. Paul & Pacific, Chicago

While it may be desirable to return a motor car to the gang that sent it in, after it has been repaired, this is not always possible and, even where it is, it may involve too much handling and shipping. On the one hand, after men have operated a car of certain kind and make, they become familiar with its general features and eccentricities, and dislike to change to any other car, of even the same type and model. Not infrequently the operator has added some fitting or handy device which he would like to continue to use.

On the other hand, where the damaged or worn car has been sent to the shop from some distant point involving loading it for shipment, a spare car is shipped to him in its place. Then, after the original car has been repaired, another loading and shipment will be necessary to get the old car back to the gang, which must then load and ship the substitute car back to the shop.

In general, we ship the substitute car to the gang before the car to be repaired is shipped to the shop, and leave this car as a permanent assignment. When the old car is repaired, it is placed in a pool for use at some other point. This procedure is usually followed for cars of the direct-drive type.

If the car is equipped with a free-running engine and the frame is in good condition, while only the engine needs a complete overhauling, a replacement engine is sent out for use before a complete failure occurs. The original engine is released to the shop and the substitute engine is installed. If the engine sent in is worth repairing it is put in good condition and transferred to a pool for shipment to some other point. If it is not worth repairing usable parts are salvaged and the remainder of the engine is scrapped.

Usually, when new cars of different type and model are sent out, a demonstrator accompanies them to instruct the operator with respect to its operation.

On a Permanent Basis

By Malcolm E. Condon
Track Supervisor, Erie, Campbell Hall, N. Y.

Experience over a considerable period has shown that the best method of making motor-car assignments is to make them to a gang or an individual on a permanent basis. Motor cars are programmed for a complete overhauling at a system shop, either periodically or on a mileage basis. During the time a particular car is out of its assigned service, as for major repairs at the system shop, or for minor repairs on the division, a substitute car of similar type and manufacture, held on the division as

a substitute car, should be assigned temporarily. As soon as the regular car is overhauled and returned, the substitute car should be shipped back to the division motor-car shop or be held at some central point on the division for similar or emergency assignment, as necessary.

Almost every motor car operator takes a definite pride in his motor car, particularly when he knows that it will always be assigned to him. He realizes that its maintenance and care are his own responsibility, and that its continued effective operation will best serve himself and his men. As a consequence, he handles it carefully, checks it periodically, oils and greases it regularly, keeps nuts tight, keeps the car clean, and is quick to report any defect requiring attention by the motor-car maintainer.

He is well aware that any failure of the motor car on the job will reduce the output of his gang. Conceivably, a failure might even jeopardize the safety of his men and himself out on the line. He appreciates fully that delays resulting from motor-car failures are costly, in money, time and effort. He makes every effort within his power to eliminate such delays by keeping *his* motor car in tip-top condition.

From the standpoint of the records, permanent assignments simplify the incidental reports. The foremen know the numbers of the motor cars assigned to other foremen; the towermen and dispatchers soon learn the numbers of the motor cars and their assigned locations. Again, the supervisor's clerk, the motor-car repair shop and the division and system offices have a permanent record, running year after year, of the same motor car assigned to the same gang, in the same service and on the same territory.

Do Present Standards Suffice?

Are present standards with respect to width of roadbed and depth of ballast sufficient to maintain track to the standard of excellence that is demanded by the speeds of today and the prospective speeds of tomorrow? What action is desirable?

Materials Differ Widely

By H. R. Clarke
Chief Engineer, Chicago, Burlington & Quincy, Chicago

In any attempt to answer this question it seems probable that the standard recommended by the American Railway Engineering Association will have to be accepted as the "present standards," since the standards of individual roads vary. The A.R.E.A. standard roadbed sections shown on pages 2-17 to 2-22 of the Manual vary in half width from 10 ft. for secondary tracks to 13 ft. for Class A main tracks. Obviously, in cuts, this width must be increased to accommodate the necessary surface ditches.

Equally obvious, the depth of ballast must be sufficient to distribute the load uniformly over the roadbed and, again citing A.R.E.A. recommended practice, it is stated on page 813 of Volume 21 that:

"The variation in intensity of pressure in the ballast lengthwise of the tie (which is dependent upon size and stiffness of tie, quality of tamping and condition of the bed on which the tie rests) becomes less and less with increase in depth, and it may be expected that the variations will be smoothed out at a depth equal to the ordinary tie spacing, or a few inches below, where there will be a fairly uniform pressure over the horizontal plane." This indicates that A.R.E.A. section No. 2, requiring 20 to 30 in. of ballast under the tie, is adequate, and practical experience bears this out.

Materials used for roadbed construction vary so greatly in character that a hard-and-fast rule as to either the width of the roadbed or the slope seems undesirable, since judgment must be used in the final determination. We believe that it is good practice to establish a general standard, but final decision with respect to slopes and width of roadbed rests with the chief engineer, his decision being based on the importance of the line, the purpose it is to serve, the characteristics of the material available for roadbed construction, and other pertinent factors.

In reaching this decision, consideration must be given to the first cost of construction, balanced against future maintenance costs. Our experience has demonstrated definitely that some increase in roadbed section and easier slopes result in more stable embankments, better-riding track and a reduction in the amount of track labor required for maintenance. The widening of cuts, thus placing the ditches at a greater distance from the track, is also definitely helpful.

Studying Longer Ties

By S. E. Armstrong
Engineer Maintenance of Way, New York Central System, New York

On this system as a whole the present depth of ballast is sufficient to maintain track to the desirable standard of excellence for present and prospective speeds. We have some places on our system, which we refer to chiefly as soft spots, which cause considerable trouble and some reduction in speed. However, during the past few years we have made considerable progress toward the elimination of these spots through the application of pressure grouting, which has stabilized many of them, with a consequent reduction in maintenance effort and cost.

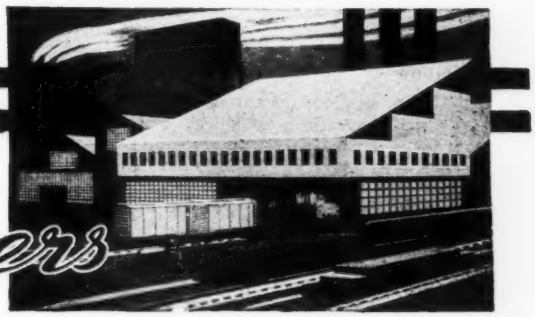
Our present depth of ballast is being augmented constantly; for example, during the past years we have increased this depth two to three inches, and in some places as much as six inches to a foot, when raising or surfacing track out-of-face. Our roadbed is also being widened at certain places and from time to time, not necessarily to permit increased speeds but to obtain a better right-of-way surface for off-track work equipment. Finally, with a view of obtaining further stability for the track and roadbed, we are studying the use of longer crossties, which would increase the ballast section to a limited extent.

Finding the Degree of Curve

We regret that through a typographical error, in the discussion of this subject by J. P. Hiltz, engineer of track, Delaware, Lackawanna & Western, on page 643 of the June issue, the following statement was made: "Square the number thus obtained and divide the result by 144." This should have read "divide the result into 144."

Cost of Wage Increase—The 18.5 cents per hour wage increase will cost the Class I line-haul railroads an estimated $725,000,000 in 1946, it was forecast by the Bureau of Transport Economics and Statistics of the Interstate Commerce Commission. In an analysis of the average straight-time hourly earnings of Class I road employees, excluding executives, general officers and assistants, the bureau points out that the 1946 hourly income, based on the 1945 straight-time hourly earnings of 91.6 cents per hour plus 18.5 cents per hour, will be $1.101 per hour, an increase of 52.7 per cent over the 72.1 cents average straight time earnings for 1939.

PRODUCTS of Manufacturers



Weed-Killing Spray

A NEW chemical weed-killing spray is now being produced by the Dow Chemical Company, Midland, Mich. The chemical, 2,4-dichlorophenoxyacetic acid, more conveniently called 2,4-D, when mixed with water in the proper proportions, is said to be capable of killing many types of weeds, although it is not harmful to most members of the grass family, nor is it poisonous to human and domestic animals.

In attacking weeds, 2,4-D is said to enter the plant at the leaf and to spread to all parts of the plant, including the root structure. It is said that one application is sufficient to kill some 100 common weeds, such as plantain, dandelion, cinquefoil and honeysuckle, although two or more applications are necessary to kill the weeds with more extensive root structures, including goldenrod, milkweed and poison ivy.

This new spray can be applied along railroad rights of way from tank cars with spray-boom attachment, or from smaller spraying equipment. Care must be taken in the application, for, although not harmful to humans, domestic animals and most grasses, the spray mixture is said to have an effect on a variety of trees, shrubs, flowers and vegetables.

Timber Truss

A NEW type of timber truss, known as the Lank-Teco truss because of its development by E. S. Lank, has been announced by the Timber Engineering Company, Washington, D. C., with the claim that the truss is believed to be the most economical for its span and load-carrying capacity that has yet been designed. The truss is a combination pitched-flat type and embodies characteristics of both the Teco truss design and the "rod-and-block" type, steel rods being used for tension members in the web system. Teco connectors are used throughout the truss.

The economy of the new design is attributed to the arrangement of the truss members, the use of lapped splices, and the use of the new Teco standard double-bevel split rings. The members are said to be so arranged that they are fully utilized and, in places of high stress, are so disposed that four adjacent faces of the intersecting members can be utilized for the placement of connectors. By the use of lapped splices, the hardware requirements are said to be reduced, while, at the same time, the truss deflection is also reduced. It is claimed that, in comparison with the conventional Pratt truss, the Lank-Teco truss requires half the amount of lumber and hardware, weighs half as much, entails half the amount of fabrication, and undergoes less than half the deflection under load for the same span and loading.

In a test of the Lank-Teco truss at the testing laboratory of the Timber Engineering Company, a 50-ft. truss was built, which was designed to carry a load of 40 lb. per sq. ft. over a 16-ft. spacing and was provided with a 2-in. camber in the bottom chord. The truss carried the full design load for more than six months with a total deflection of one inch. At twice the design load, the deflection was two inches. At 2¼ times the design load, the truss failed through shear at the splice in the bottom chord.

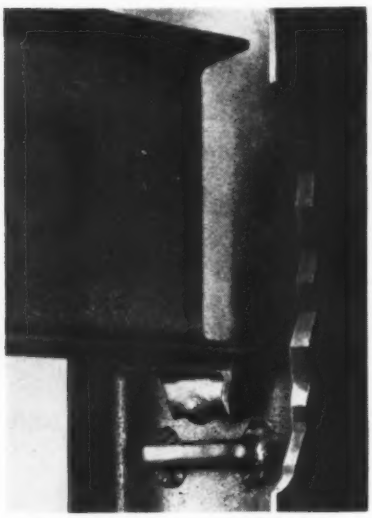
The Lank-Teco truss is claimed to be well-suited for supporting the roofs of such structures as warehouses, equipment sheds, freighthouses, garages, and similar buildings where it is necessary to have an unobstructed floor area.

This Lank-Teco 50-Ft. Truss Carried 2¼ Times Its Design Load When Tested to Failure

Saxe Welded Erection System

J. H. WILLIAMS & Co., Buffalo, N.Y., reports that the Saxe welded erection system, which has been used satisfactorily in the construction of many buildings since its development more than 10 years ago, has been further improved to simplify the erection and lower the erection costs of welded steel-frame structures. It is said that during the war this system helped save steel, reduced fabrication and erection costs, and greatly speeded up the work in many instances.

The Saxe welded erection system employs the "hook-and-eye" principle, using drop-forged steel erection seats and clips to locate and hold steel members firmly in place for welding. The seats and clips are made from selected



A Beam, with a Saxe Clip Welded to It, Being Lowered Into Position to Engage a Saxe Seat, Welded to a Column

forging stock, furnished to SAE-1020 specifications, and are shop-welded to the members, where they assure positive assembly. Individual connections will support loads up to 20,000 lb. or more, and for heavier loads they can be used in duplicate or triplicate.

Balancer for Drop-End Gondolas

THE Wine Railway Appliance Company, Toledo, Ohio, has announced the development of a device which, it is said, will permit the closing of the drop ends of gondola cars by one man without the use of special tools. Known as the Wine Drop End Balancer, the device consists of four torsion bars in two abutting pairs, encased in a heavy enclosure. The enclosure, which has a rounded bottom, replaces the low flange of the present drop end and rotates as the drop end is raised or lowered. The inner ends of the torsion bars are anchored to the center of the drop end by means of a casting and extend outward to both sides, through the enclosure, and are anchored at their outer ends to the car body by means of hinged trunnions, which are riveted to the car body.

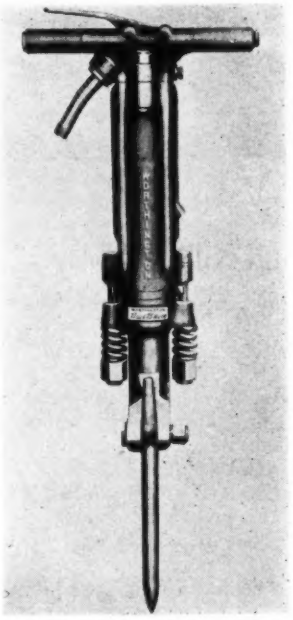
When the drop end is lowered, the anchor at the center turns the inner ends of the torsion bars while the outer ends, anchored to the car body, remain stationary in the hinged trunnions. When the drop end is in a horizontal position, the torsion bars are at maximum load, and it is said that the initial effort required to raise the drop end is negligible. Further, it is claimed that enough tension remains in the bars when the drop end is in a vertical position to hold it vertically while the latches are being secured.

The Drop End Balancer is available for all types of drop-end gondolas, and it is said that the device may be installed easily on old cars by removing the bottom portion of the old drop end and welding in place the new enclosure. For new cars the drop end will be formed to suit.

One Man Can Raise and Lower Drop Ends Equipped With the New Drop-End Balancer

Blue Brute Paving Breaker

A NEWLY-designed paving breaker, the WB-81, has been added to the line of Blue Brute air tools produced by the Worthington Pump & Machinery Corp., Harrison, N.J., and is said to have given satisfactory performance in field tests involving trenching, driving sheeting, backfill tamping and in breaking boulders where it is impossible to blast them. The unit is said to embody several new features which increase its performance, durability, versatility and ease of handling. These include a heavy-duty anvil block with a large striking surface, spring-cushioned side rods, fully-cushioned piston, built-in lubricator and a positive-action, end-seating, automatic valve



The Blue Brute Paving Breaker

which is said to be unaffected by wear.

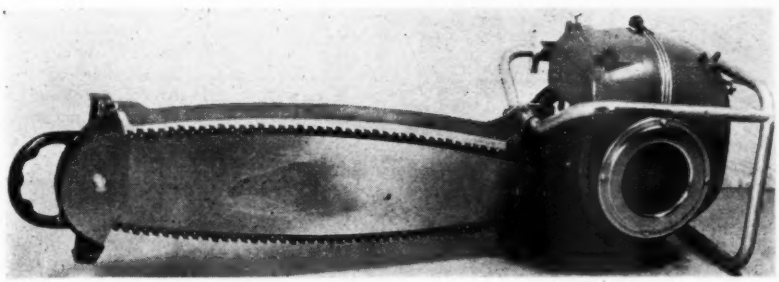
The major parts of the breaker are made of forgings and alloys and all components are said to be carefully heat treated. Self-locking nuts are used throughout, and the cylinder is precision ground and hardened, thus, it is said, assuring greater efficiency and longer life.

Gasoline Chain Saws

THE Reed-Prentice Corporation, Worcester, Mass., has added a gasoline-driven chain saw to its line of Timberhog power-driven chain saws. The new saw, said to be ideally suited for timber cutting in railway work, is available with cutting capacities of 20 in., 24 in. and 30 in., all powered by 4-hp., two-cycle, one-cylinder engines.

The saws are built of aluminum and magnesium die castings. The 20-in. saw, designed as a one-man tool, weighs 52 lb., while the 24-in. and 30-in. saws, designed for two-man operation, weigh 54 lb. and 57 lb., respectively. All of the new machines are equipped with an automatic centrifugal clutch, which is said to allow the engines to idle in the event of binding. The various parts in all the sizes are said to be interchangeable.

A feature of the new machines is the positive fuel-injection system,



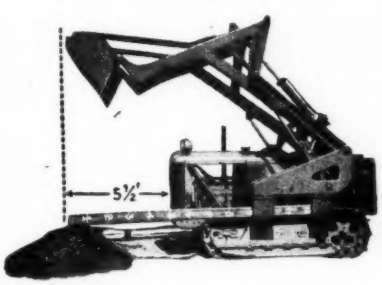
One of the New Gasoline-Driven Chain Saws

which is said to enable the saws to operate at angles up to 90 deg. without adjustment. Another feature is a newly-designed chain and guide bar, which is said to permit the accurate setting and locking of the saw frame to provide the proper chain tension.

Anti-friction bearings are used throughout, and lubrication of the chains in the new saws is achieved by positive hand-pump pressure. The chains have a 5/16-in. kerf, a ⅜-in. pitch and a speed of 1200 ft. per min.

Drott Hi-Lift Loader

A NEW front-end tractor loader, designed for mounting on Oliver Cletrac crawler tractors, has been announced by the Drott Manufacturing Corporation, Milwaukee, Wis., and is known as the Drott Hi-Lift Loader. The new unit is equipped with a 1¼-cu. yd. shovel bucket, although a 1¾-cu. yd. bucket is available for use when handling coal or other relatively light material. It is said to be capable of lifting the loaded



The Drott Hi-Lift Tractor Loader

bucket to a height of 10 ft. 8 in., and will dump the load approximately 5½ ft. in front of the tractor. Because of these features it is said to have advantages for loading trucks and other vehicles.

"Finger tip" controls are used to regulate the bucket, which may be raised or lowered while the tractor is in motion or stationary. It is hydraulically operated, using the Drott closed hydraulic system, which is said to be without vent holes through which dirt and air can enter the system or through which oil can escape. When traveling with a load, the weight of the load is not carried on the tractor, but is semi-skidded on the ground. When lifting or transporting a load, the bucket is rolled back close to the tractor, thus, it is said, eliminating spillage.

Bituplastic

FOR the protection of concrete, masonry and metal structures from corrosion and deterioration, a new type of cold-applied coating, called Bituplastic, has been developed by the Wailes Dove-Hermiston Corporation, Westfield, N. J. Laboratory and field tests of the coating over a period of years, it is said, demonstrate that it can be applied effectively to provide long-lasting protection against corrosion of chemicals, chemical fumes, moisture and temperature changes, where damp surfaces formerly interfered with the effective application of regular protective coatings.

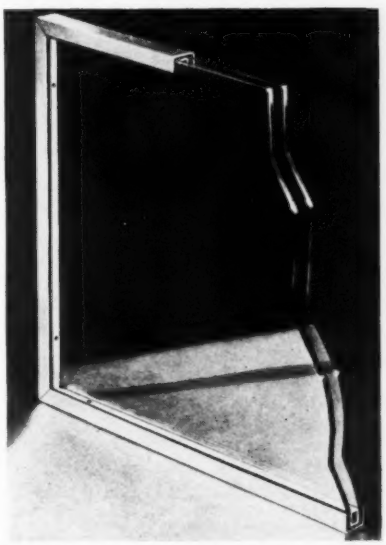
Bituplastic is an odorless and tasteless, black, irreversible dispersion, which is said to contain no volatile solvents, thereby eliminating discomfort to workmen and danger of fire or explosion when applications are made in a confined space. When dry, it is claimed, it forms a tenacious, waterproof film which does not revert to its original state. Of particular interest is the stability of the coating under heat, it being said that it will not flow or sag at any temperature up to 600 deg., its disintegration point.

The new coating can be applied in a very thick film in individual coats, either by hand brushing or with standard spray equipment. The usual application is at a rate of 75 to 100 sq. ft. per gal. per coat. Because it is rapid drying, two coats, it is said, can be applied in a continuous operation where surfaces are fairly large and normal atmospheric conditions prevail.

Bituplastic is also said to be effective as a "vapor seal" over various types of standard insulating materials. Having a strong bonding quality, it is applied directly to the insulating material or used to bond the insulation to the surface to be protected. It can also be applied over old vapor seal coatings to prolong the life of the underlying insulating material.

Double-Glazed Window

DEVELOPMENT of a new type double-glazed window insulating unit, known as Twindow, has been announced by the Pittsburgh Plate Glass Company, Pittsburgh, Pa. Twindows are integral units of two or more plates of glass enclosing either a ¼-in. or ½-in. hermetically-sealed air space, with hollow aluminum tubing being used to separate and hold the glass plates in position. The entire unit is framed within light-gage stainless steel channels, the legs of which extend ⅜ in. over the outer surfaces of the glass, an arrangement which is



The Twindow Double-Glazed Window Unit

said to insure protection during installation and use.

The Twindow unit is said to be one of the most effective dust and thermal insulating units yet devised. Condensation of vapor in the sealed air space is claimed to be prevented by means of a drying agent, placed within the spacer tubing, which has access to the air space through small holes adjacent to the internal corners. A wide variety of uses is claimed for the new unit, which may be assembled using any of the special and tinted glasses that have been developed to absorb heat, withstand impact and to achieve other special purposes.

Changes in Railway Personnel

General

James V. Dillabough, transportation engineer on the Canadian National, with headquarters at Winnipeg, Man., has retired after more than 41 years of service with this company.

G. M. Helmig, district engineer on the Missouri Pacific, at Little Rock, Ark., has been appointed trainmaster, with the same headquarters.

John T. Ridgely, general superintendent of the Southern division of the Pennsylvania, at Wilmington, Del., and an engineer by training and experience, has been appointed general real estate agent, with headquarters at Philadelphia, Pa.

Vernon P. Turnburke, assistant to the president of the Great Northern, at St. Paul, Minn., and an engineer by training and experience, has been elected vice-president, executive department, with the same headquarters.

J. P. Kiley, assistant general manager, lines east, on the Chicago, Milwaukee, St. Paul & Pacific, at Chicago, and an engineer by training and experience, has been promoted to assistant to the president, with headquarters at Seattle, Wash.

H. B. Voorhees, vice-president and executive representative of the Baltimore & Ohio at Chicago, president of the Baltimore & Ohio Chicago Terminal, and an engineer by training and experience, has retired.

J. A. Russell, general real estate agent on the Pennsylvania, at Philadelphia, Pa., and an engineer by training and experience, has been appointed assistant to the vice-president in charge of real estate, purchases, and insurance, with the same headquarters.

John H. Hande, auditor of capital expenditures on the Baltimore & Ohio, at Baltimore, Md., and an engineer by training and experience, has been appointed assistant to the vice-president in charge of operation and maintenance, with the same headquarters.

Robert H. Smith, vice-president in charge of operations of the Norfolk and Western since January 1, 1942, and an engineer by training and experience, has been elected president and a director, succeeding **William J. Jenks,** who has been elected chairman of the board.

Paul J. Neff, senior executive assistant in charge of the Gulf Coast Lines and the International-Great Northern, as well as executive assistant of the Missouri Pacific proper, at Houston, Tex., and an engineer by training and experience, has been elected chief executive officer of the Missouri Pacific Lines, with headquarters at St. Louis, Mo., succeeding **L. W. Baldwin,** whose death at St. Louis on May 14, was reported in the June issue. **F. E. Bates,** executive assistant of the Missouri Pacific, at St. Louis, and an engineer by training and experience, has been promoted to senior executive assistant in charge of the Gulf Coast Lines and the International-Great Northern, with headquarters at Houston, Tex., in which capacity he succeeds Mr. Neff.

Engineering

G. H. Fair has been appointed assistant division engineer on the Southern Pacific, with headquarters at Oakland, Cal.

C. R. Shaw has been appointed division engineer on the Southern Pacific, with headquarters at Lafayette, La., succeeding **J. A. Gorr,** who has retired.

William S. McFetridge, consulting engineer of the Bessemer & Lake Erie, with headquarters at Greenville, Pa., has retired.

H. Smith, office engineer of the New York, Chicago & St. Louis, with headquarters at Cleveland, Ohio, retired recently.

R. B. Rhode, assistant engineer, bridge department, on the Northern Pacific, has been promoted to division engineer, with headquarters at Missoula, Mont., succeeding **S. A. Erickson,** who has retired from active service.

S. H. Shepley has been appointed to the newly created position of division engineer on the Elgin, Joliet & Eastern, at Gary, Ind., succeeding **P. F. Maisenbacher,** roadmaster, deceased. The position of roadmaster on the Gary division has been abolished.

A. B. Chaney, who has been on leave of absence to serve with a special railway mission in the Republic of Ecuador, has resumed his duties as district engineer on the Missouri Pacific, with headquarters at Little Rock, Ark., replacing **G. M. Helmig,** whose appointment as trainmaster at Little Rock is reported elsewhere in these columns.

John S. McCauley, second assistant division engineer on the San Joaquin division of the Southern Pacific, at Bakersfield, Cal., has been promoted to senior assistant division engineer, with the same headquarters, succeeding **W. Riseden,** who has retired. **Matthew M. McDale,** assistant engineer on the Tucson division, has been promoted to assistant division engineer, with the same headquarters. **Eldon H. Cafer,** office engineer at San Francisco, Cal., has been promoted to assistant engineer, engineering department, with the same headquarters. **Lawrence E. McCaddon,** head estimator, has been advanced to assistant engineer on the Tucson division.

I. H. Schram, chief engineer, maintenance of way, on the Erie, at Cleveland, Ohio, has been promoted to chief engineer, system, with the same headquarters, succeeding **J. W. Smith,** who has retired after 42 years of service with the Erie. **Charles H. Splitstone,** assistant chief engineer, at Cleveland, has retired after 40 years of service. **B. Blowers,** engineer, maintenance of way, at Youngstown, Ohio, has been promoted to chief engineer, maintenance of way, with headquarters at Cleveland, succeeding Mr. Schram. **H. J. Weccheider,** division engineer at Jersey City, N. J., succeeds Mr. Blowers as engineer, maintenance of way, at Youngstown. **L. H. Jentoft,** division engineer at Salamanca, N. Y., has been transferred to Jersey City to replace Mr. Weccheider. **Louis Rossman,** division engineer at Dunmore, Pa., has been transferred to Salamanca, where he replaces Mr. Jentoft. **R. J. Pierce,** assistant division engineer at Marion, Ohio, succeeds Mr. Rossman as division engineer at Dunmore. **J. G. Ainey,** track supervisor at Hornell, N. Y., replaces Mr. Pierce as assistant division engineer at Marion.

G. E. Shaw, assistant engineer of bridges on the Canadian Pacific at Montreal, Que., has been promoted to engineer of bridges, with the same headquarters, succeeding **A. R. Ketterson,** who has retired.

James Malcolm MacBride, whose promotion to assistant engineer of track of the Canadian Pacific, with headquarters at Montreal, Que., was reported in the May issue, was born at Knoxford, N. B.,

James M. MacBride

on July 19, 1917, and was graduated in civil engineering from the University of New Brunswick in 1938. He entered railway service on April 1, 1939, as a draftsman on the Canadian Pacific at Montreal, and was advanced to assistant engineer at that point on January 1, 1944, which position he held until his recent promotion to assistant engineer of track.

T. W. Creighton, whose promotion to assistant district engineer on the Canadian Pacific, with headquarters at Vancouver, B.C., was reported in the May issue, was born on December 9, 1900, graduated from the Royal Military College of Canada in 1921, and entered the service of the Canadian Pacific on July 26, 1921, as a transitman at Winnipeg, Man. From 1923 to 1925 he was resident engineer in the construction department at various points in Saskatchewan and Alberta, and from 1926 to 1930

he served as transitman and roadmaster on the Kenora division. In 1931 Mr. Creighton was transferred to Virden, Man., as roadmaster and served in that capacity at Brandon, Man., during 1932, and on the Kenora division from 1933 to 1938. In 1939 he was advanced to division engineer, with headquarters at Revelstoke, B.C., the position he held at the time of his recent promotion.

B. Chappell, special engineer on the Canadian National, at Winnipeg, Man., has been appointed engineer of track, Western region, with the same headquarters, succeeding **E. N. Johnson,** who has retired. **F. T. Dixon,** roadmaster at Radville and Moose Jaw, Sask., has retired.

R. E. Nottingham, whose promotion to division engineer on the Louisville & Nashville, with headquarters at Nashville, Tenn., was reported in the May issue, was born at Colebrook, Ohio, on June 30, 1891, and received his higher education at Denison University. From 1914 to 1917 he served as power sales engineer with a private corporation, and from May, 1917, to January 20, 1919, he served with the armed forces in World War I. He entered railroad service on February 10, 1919, as an instrumentman on the Louisville & Nashville, at Nashville. After another short period of private employment, he returned to the Louisville & Nashville in 1921 as a rodman, and served as draftsman and instrumentman until February 1, 1924, when he became assistant engineer at Nashville, whence he was transferred to Mobile, Ala., in April, 1936. In December, 1940, he was appointed assistant engineer, miscellaneous department, in the chief engineer's office, and in October, 1941, he was promoted to assistant division engineer at Birmingham, Ala. Mr. Nottingham was advanced to assistant engineer in the chief engineer's office in October, 1943, the position he held at the time of his recent promotion.

J. W. Purdy, superintendent of the Newark division of the Baltimore & Ohio, at Newark, Ohio, has been promoted to engineer of maintenance, with headquarters at Cincinnati, Ohio, succeeding **S. A. Jordan,** who has retired after 54 years of service with the Baltimore & Ohio. **J. T. Hoelzer,** assistant division engineer at Cincinnati, has been promoted to division engineer, with headquarters at Newark, succeeding **F. D. Batchellor,** who has retired after 44 years of service with the Baltimore & Ohio.

Mr. Purdy was born at Springfield, Mo., on September 22, 1891, and was graduated from Purdue University in 1914 with the degree of B.S. in civil engineering. In January, 1917, he entered the service of the Baltimore & Ohio as an assistant supervisor, at Athens, Ohio. In March of the same year he became district bridge inspector, southwest district, at Cincinnati, Ohio, and in December, assistant engineer, engineer maintenance of way office, at the same place. From May 1, 1918, to August 1, 1919, he served with the armed forces, and returned to the Baltimore & Ohio in February, 1920, as assistant division engineer at Chillicothe, Ohio. He became supervisor at Zanesville, Ohio, in February, 1921, and assistant division engineer at Garrett, Ind., in August of the same year. In October, 1926, he was appointed district bridge inspector, northwest district, at Akron, Ohio, whence he was transferred to the southwest district, at Cincinnati, in April, 1928. Mr. Purdy was appointed assistant division engineer, at Akron, in May, 1932, and in July of that year he was transferred to Cincinnati, in the same capacity. In February, 1936, he was appointed division engineer at Akron, and in March, 1938, he was transferred to Wheeling, W. Va., in the same capacity. He returned to Akron in November, 1938, and served

J. W. Purdy

there until October, 1942, when he was appointed assistant superintendent at Garrett. Mr. Purdy was advanced to superintendent at Indianapolis, Ind., in March, 1943, and in December, 1945, he was transferred to Newark, Ohio, the position he held at the time of his recent promotion.

Track

L. J. Crang, roadmaster on the Canadian Pacific, at Outlook, Sask., has retired.

H. L. Foley, supervisor of track on the Chicago, Burlington & Quincy, at Galesburg, Ill., has been appointed roadmaster at Cameron Junction, Mo., succeeding **J. R. Caldwell,** who has retired.

R. E. Vermillion, roadmaster on the Missouri-Illinois (part of the Missouri Pacific) at Sparta, Ill., has been promoted to master of trains and track, with the same headquarters.

G. E. Gray has been appointed roadmaster on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Madison, Wis., succeeding **A. P. McMahon,** deceased. **L. E. Disch** has been appointed roadmaster at Tacoma, Wash., replacing **G. C. Modglin,** assigned to other duties.

T. G. Mingus, assistant roadmaster on the Chicago & North Western, at Milwaukee, Wis., has been appointed roadmaster at Huron, S. D., succeeding **A. W. Hyland,** who replaces Mr. Mingus at Milwaukee. **M. S. Reid,** assistant engineer at St. Paul, Minn., has been appointed roadmaster at Ames, Iowa, succeeding **C. Kratoska,** who has retired. **L. J. Simons,** assistant roadmaster at Chicago, has been appointed roadmaster at Cedar Rapids, Iowa, replacing **J. Watt,** who has retired.

J. N. Woodell, roadmaster on the Atlantic Coast Line at Jacksonville, Fla., has been appointed general roadmaster of the Southern district of the Southern Division at Lakeland, Fla., succeeding **F. C. Chandler,** who has been appointed roadmaster at Lakeland. Mr. Chandler relieves **Howard L. Slemp,** who has been transferred to Jacksonville, replacing Mr. Woodell.

H. Kyles, section foreman on the Canadian National, at Hudson Bay Junction, Sask., has been promoted to roadmaster on the Dauphin division, with headquarters at Swan River, Man., succeeding **H. J. May,** who has retired after 41 years of railroad service.

R. M. Buchanan, assistant on the engineer corps of the Central division of the Pennsylvania, has been promoted to assistant supervisor of track on the New York division at Jamesburg, N. J., succeeding **W. R. Kauffman,** who has been advanced to main line assistant supervisor of track on the Maryland division at Baltimore, Md.

Special

Walter L. Turner, Jr., has been appointed associate editor of *Railway Engineering and Maintenance*, and Railway Age, with headquarters at Chicago.

Mr. Turner was born at Bluefield, W. Va., on January 27, 1913, and was gradu-

Walter L. Turner, Jr.

ated from Virginia Polytechnic Institute in 1935 with the degree of B.S. in civil engineering. He entered railroad service on April 23, 1936, as a rodman in the construction department of the Central region of the Pennsylvania, and on March 16, 1937, he became an engineer apprentice in the maintenance of way department at Buffalo, N. Y. On January 1, 1938, he was made an assistant on the engineering corps at Wooster, Ohio. On June 1, 1938, he joined the Pennsylvania Turnpike Commission as a party chief, and served in that capacity until February 1, 1939, when he returned to the Pennsylvania as an assistant on the engineering corps, at Alliance, Ohio. On November 16, 1939, he was transferred to Niles, Ohio, and on

June 1, 1940, he was transferred to Pittsburgh, Pa. Mr. Turner was appointed assistant supervisor, at Lock Haven, Pa., on October 22, 1940, and served there until March 28, 1941, when he entered the armed forces, from which he was discharged with the rank of Major. On December 1, 1945, he returned to the Pennsylvania as assistant supervisor at Freedom, Pa., where he remained until April 23, 1946, when he resigned to join the staff of the Simmons-Board Publishing Corporation.

Bridge and Building

Harold R. Demmon, recently released from the armed forces, has been appointed assistant bridge and building supervisor on the Portland division of the Southern Pacific. **E. M. Hallam,** recently released from the armed forces, has been appointed general foreman of water and fuel service on the Portland division. **Robert D. Moran** has been appointed assistant bridge and building supervisor on the Los Angeles division.

G. R. Webber, whose promotion to chief carpenter on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Spokane, Wash., was reported in the May issue, was born in California on June 12, 1906. He entered railroad service in June, 1923, as a bridge and building carpenter on the Milwaukee. Later he was advanced to bridge and building foreman on the Idaho division, the position he held at the time of his recent promotion to chief carpenter.

L. S. Marriott, whose promotion to general building inspector on the Illinois Central at Chicago was reported in the May issue, was born at Elizabethtown, Ky., on August 17, 1894, and received his higher education at the University of Kentucky. He entered the service of the Illinois Central on June 7, 1915, as a chainman on the St. Louis division. He was promoted to rodman on January 24, 1916, and on February 5, 1917, he was advanced to instrumentman on construction. Upon his return from military service on July 16, 1919, he was again appointed instrumentman on construction. Subsequently he served as draftsman and building inspector until February 1, 1923, when he became assistant construction engineer in the building department. From 1928 to 1937 Mr. Marriott served as draftsman, rodman and instrumentman. On July 1, 1938, he was advanced to bridge and building supervisor, with headquarters at McComb, Miss., the position he held at the time of his recent promotion to general building inspector.

Obituary

Joseph Daem, roadmaster on the Canadian Pacific, at Revelstoke, B. C., died recently.

P. F. Maisenbacher, roadmaster on the Elgin, Joliet & Eastern, at Gary, Ind., died in that city on May 26.

Duncan Wanless, who retired in 1924 as bridge and building master on the Canadian Pacific, died recently at Toronto, Ont.

Association News

Metropolitan Maintenance of Way Club

The annual outing of the club was held on June 20 at the Out-of-Bounds Club, Suffern, N.Y. The program included such sports as softball, horseshoes, quoits, and golf, and prizes were awarded the winners in all activities. A buffet luncheon was served at 1:30 p.m.

Maintenance of Way Club of Chicago

The Executive committee of the club met in Chicago on June 19 to consider a number of routine matters, including the appointment of standing committees for the year. Consideration was also given to programs for the coming fall season, which will begin with the first meeting on October 28.

Bridge & Building Association

With assurance that the work of all technical committees of the association is far advanced, President Neal Howard, editor, *Railway Engineering and Maintenance*, has called a meeting of the Executive committee, in Chicago, July 8, to review, with committee chairmen, the preliminary drafts of all technical reports to be presented at the annual meeting of the association in Chicago, September 17-19. The annual meeting this year, as pointed out elsewhere in these columns, will be held concurrent with, but independent of, the annual meeting of the Roadmasters' Association, and a joint exhibit of the Track Supply Association and the Bridge and Building Supply Men's Association.

Roadmasters' Association

Upon a call by President H. E. Kirby, assistant engineer, Chesapeake & Ohio, the Executive committee of the association will meet in Chicago, July 15, to review, with the chairmen of the various technical committees, preliminary drafts of the reports to be presented at the annual convention of the association, in Chicago, September 17-19. It is also planned at that time to set up a tentative program for the convention.

The convention this year, as noted elsewhere in these columns, will be held concurrent with the annual meeting of the American Railway Bridge and Building Association and a joint exhibit of the Track Supply Association and the Bridge and Building Supply Men's Association, all at the Hotel Stevens.

American Railway Engineering Association

An unusually large number of committee meetings were held in June, this being attributable to the fact that a number of committee meetings originally scheduled during May were postponed because of the strike situation. Specifically, 11 committees held meetings during June, as follows: Wood Bridges and Trestles, June 4, Chicago; Economics of Railway Location and Operation, June 26, Toronto, Ont.; Co-Operative Relations With Universities, June 6, Pittsburgh, Pa.; Buildings, June 6 and 7, Montreal, Que.; Roadway and Ballast, June 11 and 12, at Cleveland, Ohio; Yards and Terminals, June 18, Cleveland; Ties, June 20, Roanoke, Va.; Records and Accounts, June 25 and 26, Washington, D.C.; Track, June 26, Chicago; Masonry, June 26 and 27, Pittsburgh; and Rail, June 27, Chicago.

At the time of going to press only three committees had scheduled meetings in July. The Committee on Water Service and Sanitation will meet in Chicago on July 9, the Committee on Waterproofing plans to meet at the same point on July 10, and the Committee on Economics of Railway Labor will meet at Chicago on July 25.

The printing of the proceedings for 1946 has been completed and the press sheets were delivered to the bindery on June 4. It is expected that the first copies of the proceedings will be ready for mailing to members about the middle of July. Also, the supplement to the Manual will be mailed at about the same time. The Board of Direction is planning to hold a meeting in August, although the precise date has not yet been established.

Track Supply Association; B. & B. Supply Men's Association

Detailed plans are taking shape rapidly for the joint exhibit of these associations at the Hotel Stevens, Chicago, September 16-19, in conjunction with the concurrent annual conventions of the Roadmasters' Association and the American Railway Bridge and Building Association, at the Stevens, September 17-19.

Members of the boards of direction of the two supply associations met in Chicago on June 4 to progress plans for the exhibit and for the joint annual banquet which these associations plan to tender the members of both railway associations during their conventions. To date, 72 companies have contracted for exhibit space, occupying 121 booths, with additional companies to be heard from, which insures an exhibit this year far larger than any exhibit held by the associations individually in any previous year. Following is a list of those companies that will exhibit:

Air Reduction Sales Company
American Fork & Hoe Company
American Lumber & Treating Company
Armco Drainage & Metal Products, Inc.
Austin-Western Road Machinery Company
Barco Manufacturing Company
Bernuth, Lembcke Company, Inc.
The Buda Company
Chicago Pneumatic Tool Company
Chipman Chemical Company, Inc.
Crerar, Adams & Co.
Cullen-Friestedt Company
Dearborn Chemical Company
A. P. DeSanno & Son, Inc.
The Duff-Norton Manufacturing Company
Electric Tamper & Equipment Company
Eutectic Welding Alloys Company
Evans Products Company
Fabreeka Products Company
Fairmont Railway Motors, Inc.
Hayes Track Appliance Company
George M. Hogan & Co.
Homelite Corporation
Illinois Malleable Iron Company
Independent Pneumatic Tool Company
Ingersoll-Rand Company

Johns-Manville Sales Corporation
O. F. Jordan Company
Kalamazoo Manufacturing Company
The Kershaw Company
The Lehon Company
LeTourneau, Inc., R. G.
Link-Belt Speeder Corporation
The Lundie Engineering Corporation
Maintenance Equipment Company
Mall Tool Company
Marvel Equipment Company
Massey Concrete Products Company
Mississippi Supply Company
Morden Frog & Crossing Works
Morrison Railway Supply Company
Nordberg Manufacturing Company
Northwestern Motor Company
The Oliver Corporation, Industrial Division
Oliver Iron & Steel Corporation
The Oxweld Railroad Service Company
The P & M Company
Pettibone Mulliken Corporation
Pocket List of Railroad Officials
Power Ballaster Company
The Q and C Company
Racine Tool & Machine Company
The Rail Joint Company, Inc.
The Rails Company
Railway Engineering and Maintenance
Railway Maintenance Corporation
Railway Purchases & Stores
Railway Trackwork Company
Ramapo Ajax Division, American Brake Shoe Company
Reade Manufacturing Company, Inc.
Rust-Oleum Corporation
Snap-On Tools, Inc.
Sperry Rail Service
Templeton, Kenly & Co.
Timber Engineering Company
Union Metal Manufacturing Company
Unit Rail Anchor Company
Warren Tool Company
Woodings-Verona Tool Works
Woodings Forge & Tool Company
Woolery Machine Company
Worthington Mower Company
Worthington Pump & Machinery Corporation

Inquiries concerning the exhibit should be directed to Lewis Thomas, secretary of the Track Supply Association, 59 E. Van Buren St., Chicago, who is acting as Director of Exhibits.

Railway Tie Association

The twenty-eighth annual convention of the association will be held on July 15-16 at the Netherland Plaza Hotel, Cincinnati, Ohio. This two-day meeting was originally scheduled for May 28-29, but was postponed because of the railroad strike. The program for the rescheduled meeting will be the same as that set up for the earlier meeting, and will include a large number of addresses and reports, a number of which will be of special interest to railway maintenance officers. Among these will be a symposium of addresses on What Lies Ahead For the Crosstie Industry? which will be participated in by W. J. Burton, assistant to chief engineer, Missouri Pacific, St. Louis, Mo.; G. E. Getty, statistician, Bureau of Railway Economics, Association of American Railroads, Washington, D. C.; and E. D. Jones, T. J. Moss Tie Company, St. Louis. Mr. Burton will discuss the subject from the standpoint of the railroad engineer, Mr. Getty from the standpoint of the railroad economist, and Mr. Jones from the standpoint of the crosstie producer.

In other addresses, W. G. Vollmer, president, Texas & Pacific, Dallas, Tex., will discuss How Rail Transportation Suffers From Unfair Treatment; C. Miles Burpee, vice-president, Simmons-Boardman Publishing Corporation, New York, will discuss The Active Demand For Lumber and Its Effect on Crossties; L. S. Jeffords, chief engineer, Atlantic Coast Line, Wilmington, N. C., will discuss The Nine-Foot Tie on the Atlantic Coast Line; and Clarence S. Burt, manager, Forest Products Bureau, Illinois Central, Memphis, Tenn., will discuss The Effect of Traffic on Crossties.

All sessions of the meeting will be presided over by E. J. McGehee, Wood Preserving Division, Koppers Company, Pittsburgh, Pa.

Supply Trade News

General

The Flintkote Company of New York has been awarded the Navy Department Bureau of Ordnance Development Award for distinguished service to the research and development of naval ordnance during World War II.

Railway Engineering and Maintenance has moved its office at Dallas, Tex., to more spacious quarters in a newly remodeled and modernized office building located at 2909 Maple Avenue. **Joe Sanders** will continue in charge of advertising sales.

The Eaton Manufacturing Company has announced the erection of a new office building in downtown Massillon, Ohio. This new building is the first of a series of contemplated expansions to provide facilities for the Reliance Division's increased activities in the production of lock washers, snap and retainer rings, and cold drawn wire. According to present plans, the new building will be ready for occupancy early in the Fall.

The **Ransome Machinery Company,** Dunellen, N.J., a subsidiary of the Worthington Pump and Machinery Corporation, has appointed the following equipment companies as exclusive distributors in their respective territories of Ransome Blue Brute pavers and mixers: Wilhelm-Davies Co., Inc., Hamden, Conn.; Interstate Truck & Equipment Co., Billings, Mont.; Airport Machinery & Storage Co., Anchorage, Alaska; J. K. Wheeler Machinery Co., Salt Lake City, Utah; Burford-Toothaker Tractor Co., Montgomery, Ala.; Shaw Equipment Co., Dallas, Tex.; Dempster Bros., Inc., Knoxville, Tenn.; Carroll-Edwards & Co., Cincinnati, Ohio; Bud Fisher Co., Albuquerque, N.M.; Andrews Equipment Service, Portland, Ore., and also Spokane, Wash.; Epperson & Co., Tampa, Fla.; Highway Equipment & Supply Co., Orlando, Fla.; Jackson Road Equipment Co., Jackson, Miss.; The Finn Equipment Co., Cincinnati, Ohio; Caird Engineering Works, Helena, Mont.; Arrow Supply Co., Inc., Wilkinsburg, Pa.; Drott Tractor Co., Inc., Milwaukee, Wis.

Personal

W. Luther Lewis, executive vice-president of the **Chicago Pneumatic Tool Company,** has been elected president, succeeding **H. A. Jackson.** Mr. Jackson, chairman of the board of directors for 14 years and president of the company for 28 years, has been re-elected chairman of the board of directors.

Charles A. Mayer has been appointed assistant engineer in the office of **The Asphalt Institute,** with headquarters in New York.

Joseph M. Welles has been appointed to represent the **Rust-Oleum Corporation** in Southern California, with headquarters at 5421 Santa Fe avenue, Los Angeles, Cal.

A. P. Hall has been elected vice-president of the **American Chain & Cable Co., Inc.** Before joining the company in 1944, he had been in the steel industry for 22 years. He will continue his present duties as general manager of sales, and his headquarters will remain at 230 Park avenue, New York.

George R. Tierney, assistant division sales manager of the **Johns-Manville Corporation,** has been appointed division sales manager, Pacific division, transportation department, with headquarters at San Francisco, Cal. **John H. Goodwin** has been appointed assistant division sales manager at San Francisco, succeeding Mr. Tierney.

Gilbert P. Bogert, executive vice-president of the **Oxweld Railroad Service Company** (a subsidiary of the Union Carbide & Carbon Corp.) at Chicago, has been elected president, with the same headquarters. He succeeds **John H. Rodger,** who becomes chairman of the board of directors and who was recently elected vice-president of the parent company in charge of its railroad division.

Mr. Bogert was born at Bloomfield, N. J., and was graduated from the University

Gilbert P. Bogert

of Virginia in 1913, and from that year he has been continuously associated with various units of the Union Carbide and Carbon Corporation, with the exception of a period of service as a lieutenant in the Air Corps during World War I. After his release from the armed forces, Mr. Bogert was assistant to the sales manager of The Linde Air Products Company, at New York. Later he became western sales manager at Chicago for the same company, and still later, sales manager for the eastern division. During a seven-year residence in Canada, starting in 1923, he was general manager of the Dominion

Oxygen Company, Ltd.; The Prest-O-Lite Company of Canada, Ltd.; and the Canadian Railroad Service Company, Ltd. In 1927 he became vice-president of the first two of these companies, and last year he was elected president of the Canadian Railroad Service Company, Ltd. In 1930 Mr. Bogert was elected vice-president of the Oxweld Railroad Service Company, at Chicago, and in 1944 he became executive vice-president, the position he held at the time of his recent election to the presidency.

John S. Vreeland, eastern editor of *Railway Engineering and Maintenance* and eastern engineering editor of Railway Age, has been appointed sales representative for the railway publications of the **Simmons-Boardman Publishing Corporation,** with headquarters as before in New York. The railway publications of the company include *Railway Engineering and Maintenance*, Railway Age, Railway Mechanical Engineer, Railway Signaling and the Locomotive, Car Builders', and Railway Engineering and Maintenance Cyclopedias.

Mr. Vreeland was born at Cincinnati, Iowa, on November 16, 1907, and was graduated in chemical engineering from Iowa State College, Ames, Iowa, in 1928. Prior to graduation, he worked two summers in the engineering department of the Chicago, Rock Island & Pacific, and after graduation went with that road as a rodman. He was later promoted to instrumentman and served in the engineering department at various points in Iowa, Minnesota and Missouri. He also worked on new line locations and construction in Missouri, and as an inspector checking joint facility accounts. In June, 1931, he was appointed a supervisor of

John S. Vreeland

track, and served in that capacity at various points in Arkansas, Oklahoma, Iowa and Missouri.

In April, 1938, Mr. Vreeland became associated with the Simmons-Boardman Publishing Corporation as associate editor of *Railway Engineering and Maintenance* and Railway Age, at Chicago, and in September, 1944, he was promoted to the positions he held at the time of his present appointment, making his headquarters at New York. Mr. Vreeland is secretary-treasurer of the Metropolitan Maintenance of Way Club of New York.

The **Link-Belt Company,** Chicago, has opened three new sales offices, at Moline, Ill., Cincinnati, Ohio, and Birmingham, Ala., as means of offering a better postwar service in these cities. Those in charge of the branches are, respectively, **M. J. Parykaza, L. R. Clark,** and **C. C. Wiley,** all of whom carry the title of district sales engineer.

The Eaton Manufacturing Company, Massillon, Ohio, has announced the addition of four new men to the sales department of the Eaton Reliance division: **Ralph O. Amsden, Jr.,** with headquarters at the company's Detroit office; **John S. Kerr,** with headquarters at the company's Cleveland office; **John L. Knott,** with headquarters at the company's New York office; **Clifford A. Esinhart,** western railroad representative, with headquarters at the company's Chicago office.

J. V. Houston has been appointed vice-president of the Ramapo Ajax division of the **American Brake Shoe Company,** with

J. V. Houston

headquarters in Chicago. He is in charge of the operations of the eight Ramapo Ajax plants in the United States, and the Canadian Ramapo Iron Works, Ltd., in Canada. Mr. Houston is a graduate of the University of Illinois, class of 1909. He first joined Ramapo Ajax in 1910 in the engineering department, and since then has been sales engineer, sales manager, assistant chief engineer and general superintendent.

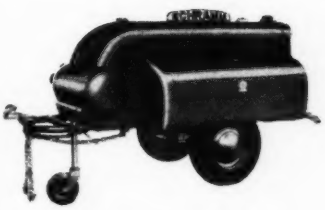
Recent changes in organization have been announced by **Armco Drainage & Metal Products, Inc.,** Middletown, Ohio—a subsidiary of the American Rolling Mill Company. Since the Armco Railroad Sales Company, which formerly handled the sale of both sheets and drainage products, has been dissolved, the sale of drainage products to railroads is the responsibility of the various divisions of Armco Drainage & Metal Products, Inc. Similarly the activities of the construction division of the company have been decentralized and are being handled by the Armco drainage divisions. **E. T. Cross,** who for the past 19 years has been engaged in railroad sales and construction work, has been transferred to the general office staff as a vice-president of Armco Drainage & Metal Products, Inc., at Middletown. He will serve as co-ordinator of construction activities for Armco, and for other subsidiaries of the parent company, and also as counselor and advisor in connection with the sales of fabricated products to railroads. **W. B. Roof,** formerly division engineer of the construction division, will be assistant to E. T. Cross in

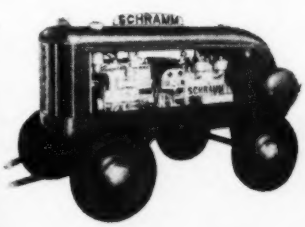
E. T. Cross

the coordination of construction activities, with headquarters at Middletown. **D. R. Baird,** superintendent of the Middletown district of the construction division, will be with the O'Neall division at South Bend, Ind., as construction superintendent. **J. D. Faylor,** construction superintendent of the Des Moines (Iowa) district, has been transferred to the Iowa-Nebraska division as division engineer, and will have charge of all construction work and railroad sales for that division. His headquarters will remain at Des Moines, Iowa. **H. R. Speir,** superintendent of the construction division at Houston, Tex., is transferred to the same job for the southwestern division of Armco Drainage & Metal Products, Inc., at Houston. **C. E. McGraw** has been appointed construction superintendent of the Hardesty division, at Denver, Colo. **C. M. Colvin,** construction superintendent for the California, Oregon, and Washington territory, will remain in his present capacity and as assistant to **K. A. Smith,** manager of railroad sales for Armco Drainage at Berkeley, Cal. **J. F. Hunter** will superintend construction work for the Dixie division, with headquarters at Atlanta, Ga. **Nick Rozema** will have charge of construction work for the Missouri-Kansas division, with headquarters at Topeka, Kan. **P. O. Hansen** heads the construction department of the central division at Middletown. The following men continue in charge of sales in their respective territories: **W. O. Robertson,** who will also be in charge of construction activities, at Baltimore, Md.; **G. R. Betts** at Chicago; **N. A. Powell** at Houston, Tex.; **K. A. Smith** at Berkeley, Cal., where a new district was formed recently. New railroad sales managers have been added to division staffs. In the Hardesty division at Denver, **Ralph N. Tracy** is in charge. **H. S. Claybaugh** is railroad sales manager in the northwestern division at Minneapolis, Minn. In the central division, **C. M. Anderson,** superintendent of construction in the Philadelphia district of the construction division.

(Continued on page 766)

WHERE YOUR VERSATILE AIR COMPRESSOR COMES FROM!





The big Schramm Plant, with greatly increased facilities, furnishes air compressors to all industries. That represents thousands of Schramm Compressors, portable and stationary, now being used for every type of compressed air job.

Illustrated are two Schramm models. These units . . . as all Schramm Compressors . . . are lightweight, compact, rugged. They contain such features as 100% watercooled, mechanical intake valve, forced feed lubrication.

Schramm Compressors are modern to meet modern needs. Facilities, workmanship, knowledge, all go into the manufacturing of each Schramm, and it is for these reasons you get real savings when you use a Schramm Air Compressor.

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THE COMPRESSOR PEOPLE
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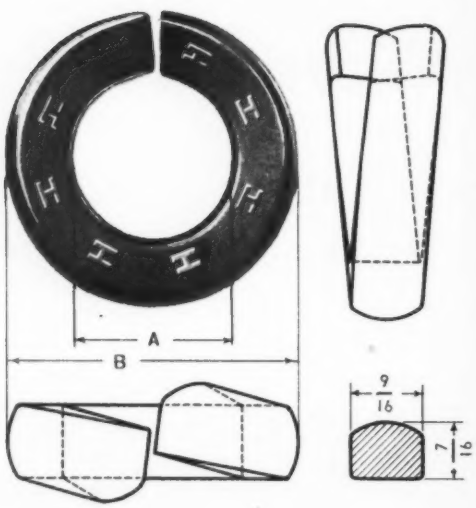
TRACK REPAIRS ARE COSTLY!

SAVE

ON YOUR TRACK MAINTENANCE BY USING HUBBARD SUPER SERVICE ALLOY SPRING WASHERS



Their high reactive pressure retards wear between rails and joint bars, adding to the useful life of rail and substantially reducing maintenance costs.

Specify HUBBARD SUPER SERVICE ALLOY SPRING WASHERS and conserve both TRACK LABOR AND MATERIAL.

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AMERICAN RAILWAY BRIDGE & BUILDING ASSOCIATION

First

RAILWAY SUPPLY CONVENTION EXHIBIT IN 4 YEARS

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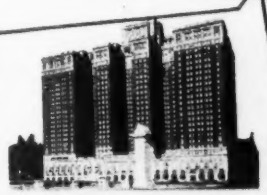
OPEN A DAY BEFORE THE CONVENTION

Arrange now to include **Chicago—Stevens Hotel September 16-17-18-19** in your fall plans.

With heavy improvement and modernization programs ahead, your attendance at the important 3-day full conventions of the Roadmasters & Maintenance of Way Association and the Bridge & Building Association, and the concurrent exhibit of railway materials and work equipment is more vital than ever before.

The exhibit, sponsored jointly by the Track Supply Association and the Bridge & Building Supply Men's Association, will be the largest in history, and will yield maximum information on the newest in railroad materials and work equipment. Progressive suppliers will be represented, all conveniently in one exhibition hall, under the same roof as the conventions.

same time and place



HOTEL STEVENS CHICAGO

September 16, 17, 18, 19 1946

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REM

(Continued from page 762)

becomes manager of railroad sales, with headquarters at Cleveland, Ohio. **Van W. Davis,** formerly superintendent of the construction division at Atlanta, has been appointed manager of railroad sales for the Dixie division at Atlanta. **Felix Truss** is in charge of railroad sales for the Missouri-Kansas division, with headquarters at St. Louis, Mo.

Alfred B. Drastrup has been appointed manager of the alloy steel sales department of the **A. M. Byers Company** of Pittsburgh, Pa. Mr. Drastrup has been associated with the company since 1931 in accounting, industrial engineering and plant management capacities, and previously was with the Columbia Steel Company, Torrance, Cal., and the Gary works of the United States Steel Corporation, Gary, Ind. Born in Denmark, Mr. Drastrup received his education in business administration and accounting at schools in both that country and the United States.

Alfred B. Drastrup

Production of alloy steel by the company was started in 1941 to complement the manufacture of wrought iron products, in which it has been engaged for more than 80 years. Facilities for the production of hot-rolled and cold-drawn alloy steel bars and wire are now being installed at the company's Ambridge, Pa., plant, and will be ready for initial manufacturing operations the latter part of this year.

W. Luther Lewis, who has been executive vice-president of the **Chicago Pneumatic Tool Company** since 1931, has been elected president to succeed **H. A. Jackson,** who will continue as chairman of the board of directors. **Robert A. Rankin** has been appointed sales manager of the Diesel engine division. Mr. Rankin, formerly assistant manager of the engine division, succeeds **H. W. Buker,** head of Diesel engine sales for the last 20 years, who has retired after 26 years' service with the company.

A. E. Ferguson, recently released from the armed forces, has returned to his position as western sales manager of the **American Lumber & Treating Company,** with offices in the Chamber of Commerce Building, Los Angeles, Cal., where he will have general charge of all sales operations handled through sales offices at Los Angeles and San Francisco for the states of California, Oregon, Washington, Idaho, Nevada, Utah, Arizona, and New Mexico. **R. B. Bullion** has been appointed superintendent of the company's wood-treating plant at Gainesville, Fla., succeeding **Norman A. Meserve,** who has been appointed head of production in the southeastern area, with headquarters at Florence, S. C.

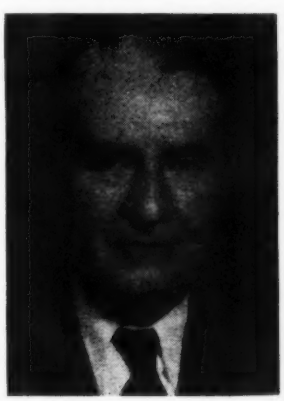
The Barco Manufacturing Company, Chicago, has announced the appointment of new sales representatives for Barco gasoline hammers. **D. W. Jacquays,** 132 W. Granda, Phoenix, Ariz., will cover the state of Arizona, except Mojave and Yuma counties, and supplement the service of the **Francis Wagner Company,** El Paso, Tex., which extends into Arizona. **The Brown Machinery Company,** Oklahoma City, Okla., will cover the state of Oklahoma. **Fletcher Equipment & Supplies,** 609 Tchoupitoulas street, New Orleans, La., will cover southern Louisiana and southern Mississippi. **A. B. Pinson** becomes sales representative for the south Atlantic states, and **W. S. Withers** will represent the company in the northeastern Atlantic states.

Obituary

Tom W. Aishton, district sales manager at Chicago for the National Malleable & Steel Castings Co., died on June 1, in an Evanston (Ill.) hospital.

Herbert N. West, vice-president of the Weir Kilby Corporation, Cincinnati, Ohio, died in that city on June 18.

Emmanuel Woodings, vice-chairman of the board of the Woodings Forge & Tool Company and the Woodings-Verona Tool Works, whose death at Pittsburgh, Pa., on May 8 was reported in the June issue,



Emmanuel Woodings

began his career as an apprentice machinist in the shops of the Verona Tool Works (now a part of the Woodings-Verona Tool Works). After 14 years in the shops, he advanced through the positions of foreman, general manager, vice-president, and president. In 1924 he left the Verona Tool Works to form his own company—the Woodings Forge & Tool Co., which in 1931 became associated with the Verona Tool Works.

BEALL Hi-Duty SPRING WASHERS

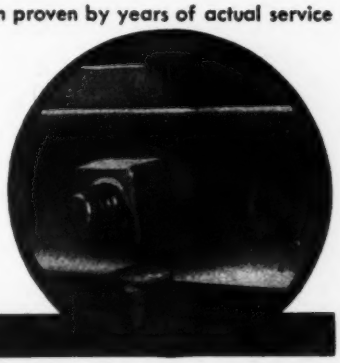
BEALL Hi-Duty SPRING WASHERS are made especially to stand the strain of the heavy-duty rail service required by today's high-speed freight and passenger trains.

We control every step of their manufacture — from the specification of the specially-developed formula and process used in making the steel to the forming, hardening, tempering and testing operations.

Their dependability has been proven by years of actual service on hundreds of railroads.

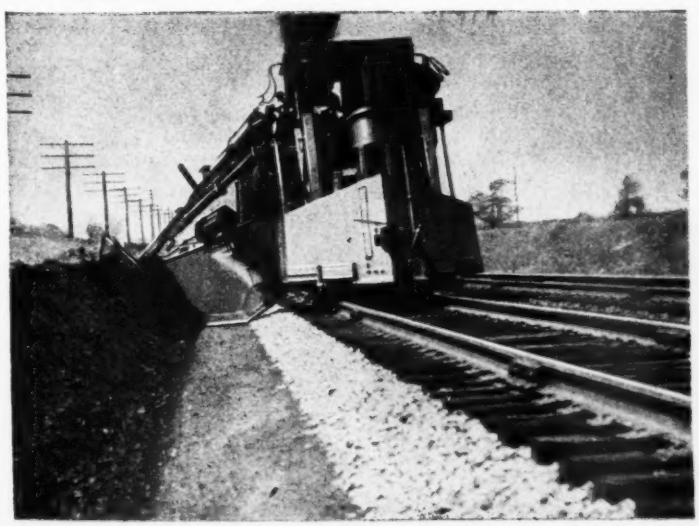
made especially for Railroad Service

BEALL HI-DUTY SPRING WASHERS, being made especially for railroad service are strong and tough, yet provide the necessary "springing action" required at rail joints, frogs and crossings.



BEALL TOOL DIVISION (HUBBARD & CO.)
140 Shamrock St., EAST ALTON, ILL.
SPECIALIST MANUFACTURERS OF SPRING WASHERS

10 MILES OF ROADBED *PER DAY* DITCHED AND SHAPED...



. . . *Both sides*

That's the sort of result several railroads are getting with the Jordan Spreader-Ditcher—and the kind you can reasonably expect. Such performance translates the Jordan's enormous strength and versatile usefulness into the tangible economies. Literally it "does the work of an army of men."

To *see* the Jordan in action on many essential operations, send for the handsome new Jordan Catalog—nearly one hundred action pictures. Glad to send it to railway, industrial and public officials when requested on business stationery.

O. F. JORDAN COMPANY

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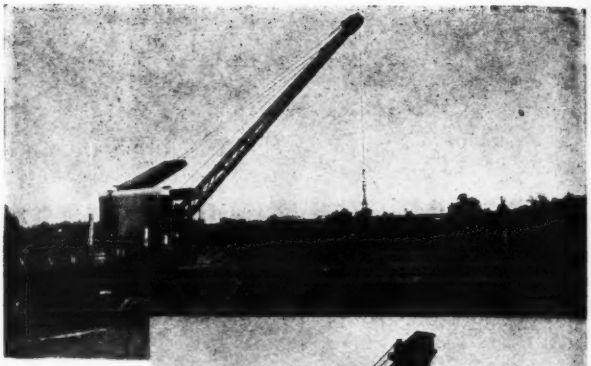
EAST CHICAGO, INDIANA

Stretch Every Hour

with

BURRO CRANES



Faster schedules and heavier train loadings are increasing the need for maintenance-of-way work—and the manpower shortage for this vital work is as acute as ever.

Because Burro Cranes are built for railroad maintenance work, even short-handed work gangs can stretch every hour to produce more. The Burro's ability to get out on the job in a hurry, hauling its own supply cars and work gangs (often eliminating need for work train or locomotive) was never more important than now. With bucket, magnet, rail tongs, dragline or hook, the Burro is a fast worker. Independent friction clutches make hoisting, swinging, traveling or boom raising either independent or simultaneous operations. Fast travel speeds, elevated boom heels for working over high-sided gondolas, short tail swing that will not foul adjacent track are only a few of the features that have made Burro the most demanded and hardest working railroad crane on the road. CULLEN-FRIESTEDT CO., 1301 S. Kilbourn Ave., Chicago 23, Ill.

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100% Self-Contained

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Gasoline Hammer

PAVING BREAKERS

BUST Concrete – **DRIVE** Spikes – **CUT** Asphalt
DIG Clay and Shale – **TAMP** Backfill

2,000 heavy blows per minute make short work of demolition, cutting and digging jobs.

No cumbersome auxiliary power equipment to move around on the right-of-way—no hose or cables to kink or tangle—its 100% self-contained feature makes it a real asset to any B & B or Section Crew.

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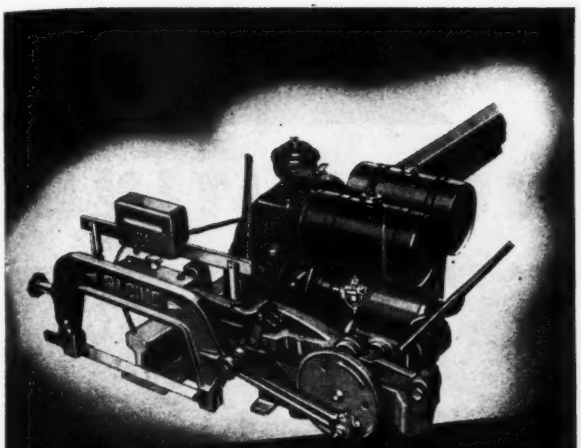

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High Speed-Portable
RAIL CUTTERS

NOW MORE NECESSARY THAN EVER

Because Racine Rail Cutters do a faster, more accurate rail cutting job with less help and at lower cost, they are the choice of maintenance-of-way departments of leading railroads.

Now you can crop and fit rails right on the track without causing traffic delays. Here is a lightweight portable rail cutter that can be operated by *just one man*. Cuts fast, smoothly and accurately. Sawing the rail eliminates tiny fractures that may lead to dangerous rail failure.

Racine Rail Cutters are used wherever track work is to be done. Ideal for frog and switch work, at interlocking and reclamation plants and in terminals.

The standard model will cut rail 7⅜" high by 6¾" wide; extra capacity model will cut 10" high by 6¾" wide rails. Available with either gasoline engine, electric or air motors. A copy of Bulletin 58-A with complete details is yours for the asking. Address RACINE TOOL AND MACHINE COMPANY, 1738 State Street, Racine, Wisconsin.

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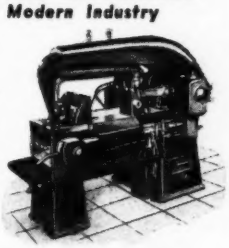
We manufacture a complete line of metal saws for cutting any metal. Available are models for high speed production and general shop work. Capacities 6"x6" to 20"x20". Each model is equipped with the most simple and latest operating and control devices for fast, accurate metal cutting. Catalog No. 12 illustrates and describes our complete saw line. Write for your copy.



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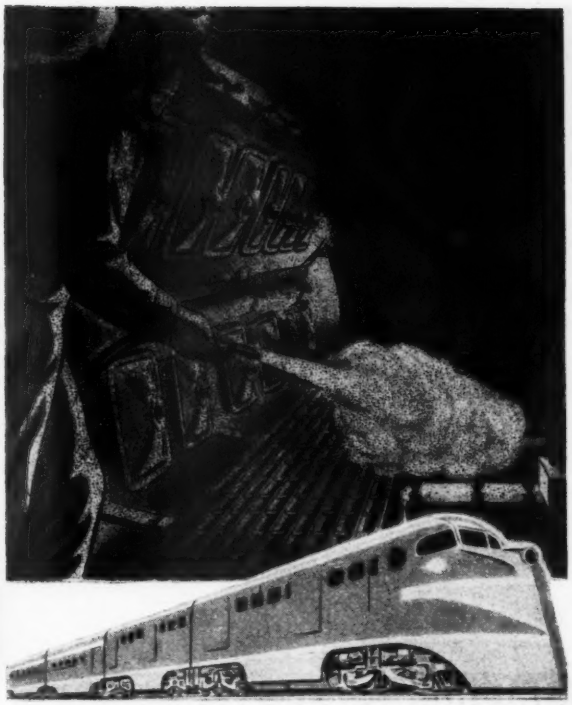

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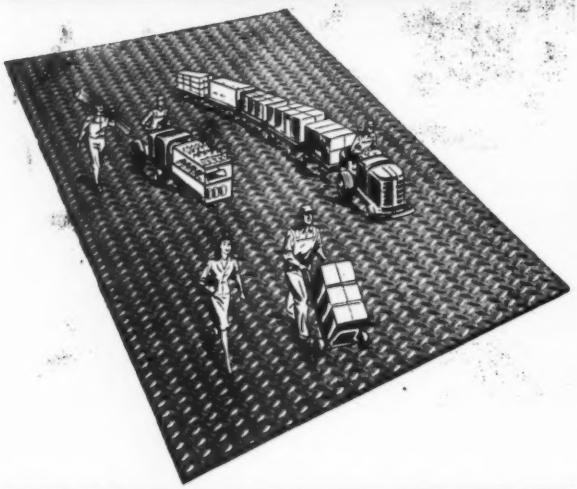

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PLANT MANAGERS interested in efficient operation and better production appreciate the confidence gained by employees standing or walking on Inland 4-Way Floor Plate. Its safety and fireproof qualities mean less liability while lower original installation and maintenance costs bring added economy.

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SAFETY ENGINEERS can breathe a sigh of relief when slippery, dangerous floors are covered with Inland 4-Way Floor Plate. They know that, installed on floors, ramps, walkways, steps, platforms or any place where slips or falls may occur, it provides a safe surface that prevents slipping and falling.

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MAINTENANCE ENGINEERS like the way Inland Floor Plate can be installed over all types of worn floors or placed over wooden or steel joists without additional support on original jobs. It's the most rugged flooring they can install . . . sweeps and mops easily, drains freely and can be quickly painted.

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PURCHASING AGENTS specify Inland 4-Way Floor Plate because it is promptly available from conveniently located warehouse distributors in ¾" to 16 gauge thicknesses, does a better job, and everyone from plant manager on down gets the best results.

Write for your copy of the Inland 4-Way Floor Plate Catalog — samples are available upon request.
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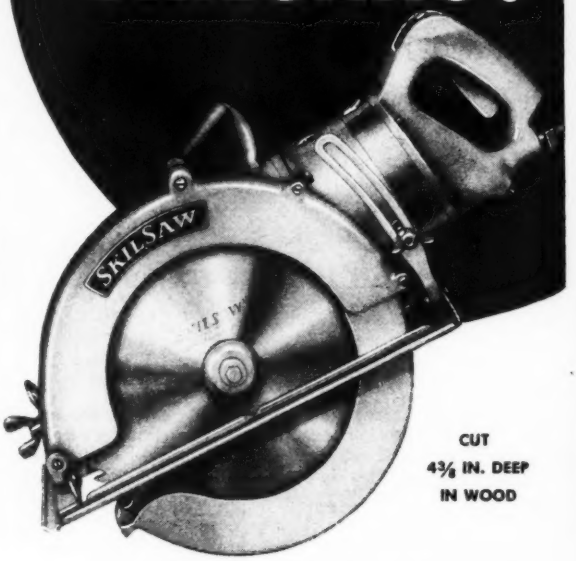
NO WAITING

for Pneumatic SKILSAWS!



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● Your distributor can supply you now with these powerful *pneumatic* SKILSAWS that cut 4 x 8's fast . . . 8 x 16's in 2 quick cuts. Operate on any 80-100 lb. air pressure line. Require only 50-55 cu. ft. of free air per minute under normal load. Give you outstanding safety features including leakproof throttle valve that cuts off air instantly when closed . . . positive safety lock that prevents accidental starting . . . automatic telescoping guard that shields the saw blade. Ask your distributor today for a demonstration of *pneumatic* SKILSAW!

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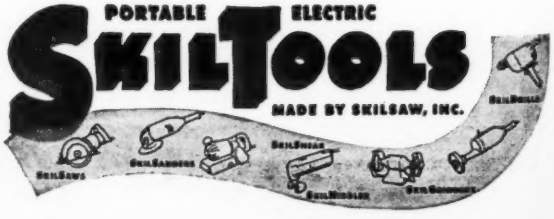
SKILTOOLS
MADE BY SKILSAW, INC.



6 Points

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- Sure, sensitive response to air-operated controls speeds up the job with less operator fatigue.
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- One-piece cast steel bed insures rigidity of mechanism, prolonging crane life in constant heavy service.
- Rotating and travel friction disc clutches with 1-point adjustment reduce wear and strain on mechanism.
- Industrial Brownhoist Locomotive Cranes assure fast, economical handling of all materials with hook, magnet, or bucket with a minimum of downtime.

The I.B. 17-20 ton traveling ore bridge illustrated here typifies the engineering and construction superiority found in Industrial Brownhoist bridges, car dumpers, portal pier cranes, and other big materials handling equipment. For the engineered answer to your materials handling problems get in touch with I.B.

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52 Lbs. $325.00

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57 Lbs. $345.00

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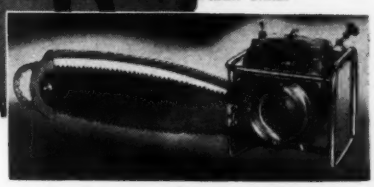
...to 2 man saw with ...per's end. Available ...rd 24 and 30" capa... man units.



NO OTHER SAW HAS THIS BIG 4 COMBINATION

HORSEPOWER: Lightweight 2 cycle 4 H. P. air cooled gas engine, die cast of aluminum and magnesium. Power far in excess of load requirements.

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TIMBERHOG SAWS
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Track Maintenance Time and Cost

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PORTABLE RAIL GRINDER

★ *Off-The-Track*
★ *Easily Portable*
★ *Efficient*
★ *Safe*
★ *Economical*

You can reduce wear and tear on rolling stock, reduce road bed maintenance and increase rail life with this powerful light weight, off-the-track 6 H.P. Mall Rail Grinder. The variable speed gasoline engine provides abundant power for smoothing off rail joint welds, grinding frogs, switch points and crossings.

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Other MALL Portable Power Tools include Cross Slotters, Gasoline Engine, Pneumatic and Electric Concrete Vibrators and Surfacers, Gasoline Engine and Pneumatic Chain Saws, Electric Circular Saws, Electric Drills, Flexible Shaft Machines with attachments for sanding, grinding, polishing, wire brushing, buffing and drilling.

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Railroad Department

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Mall REG. U.S. PAT. OFF. PORTABLE POWER TOOLS

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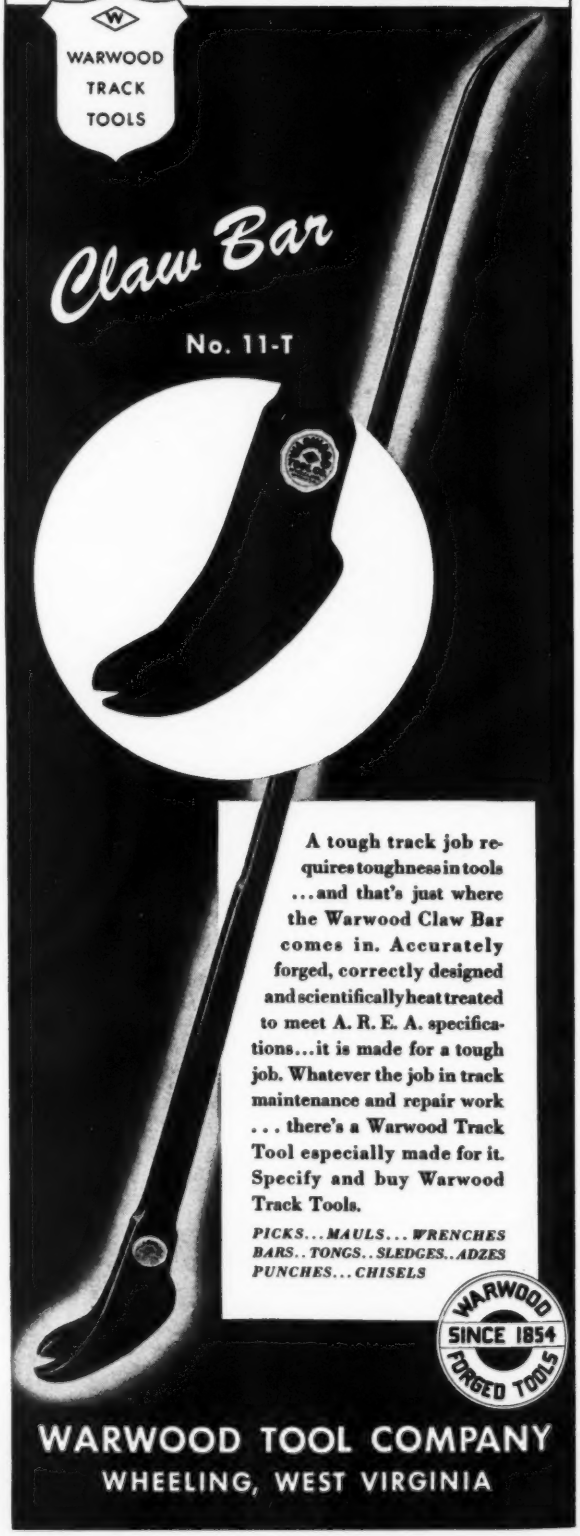
WARWOOD TRACK TOOLS

Claw Bar

No. 11-T



A tough track job requires toughness in tools ...and that's just where the Warwood Claw Bar comes in. Accurately forged, correctly designed and scientifically heat treated to meet A. R. E. A. specifications...it is made for a tough job. Whatever the job in track maintenance and repair work ... there's a Warwood Track Tool especially made for it. Specify and buy Warwood Track Tools.

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WARWOOD SINCE 1854 FORGED TOOLS

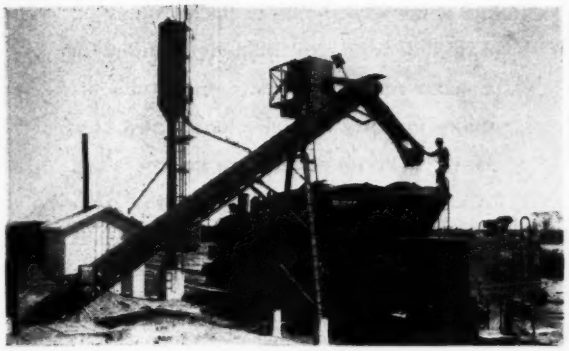
WARWOOD TOOL COMPANY

WHEELING, WEST VIRGINIA

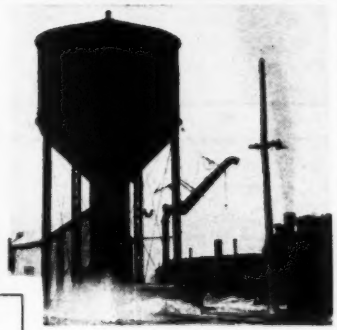
RUST STOPS—

Protection Starts *the minute*

RUST-OLEUM *covers metal*



IT'S AIR-TIGHT, WATERPROOF, ELASTIC!



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ARE IDEALLY SUITED TO RAILWAY MAINTENANCE SERVICE

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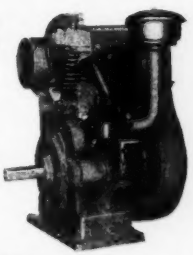
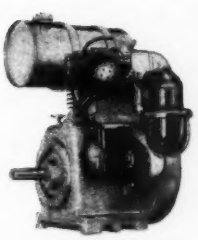


Models ADH, AEH, AFH, AHH, AGH, 4-cycle single cylinder standard engine, 3 to 9 hp.



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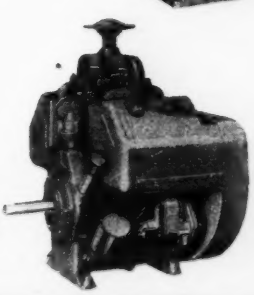

Model VE-4 V-type, 4-cycle, 4 cyl. Standard Engine.

Most H.P. per pound

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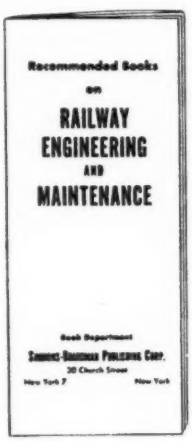

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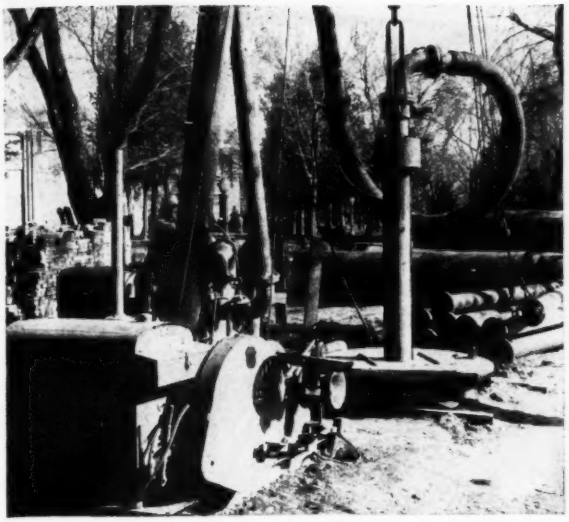

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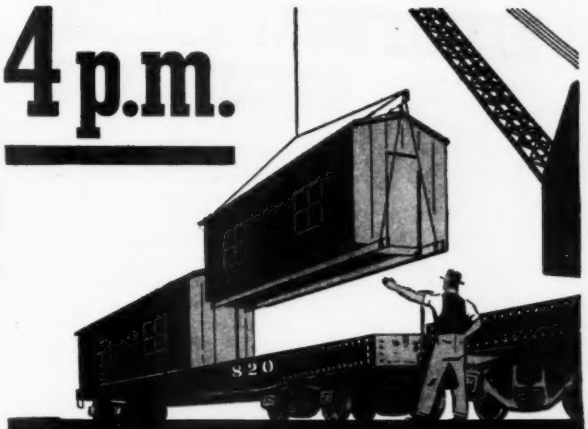

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6 p.m.

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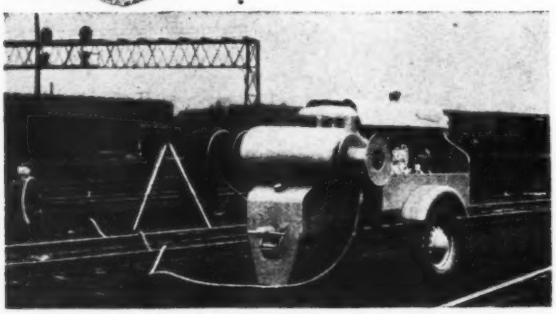

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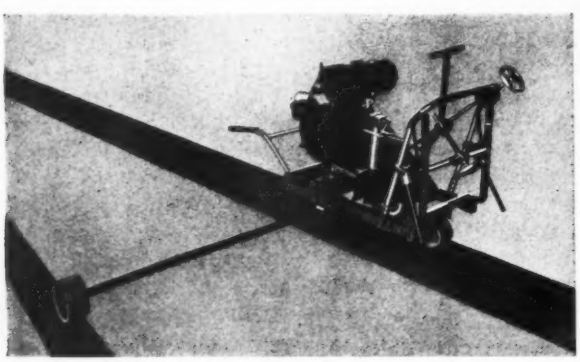

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Model 2101

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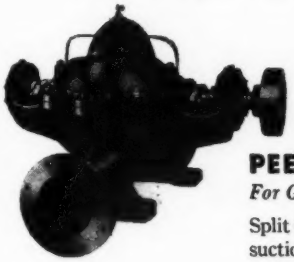

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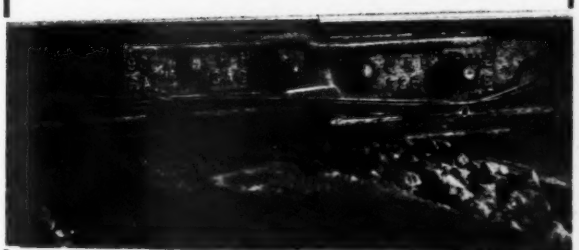

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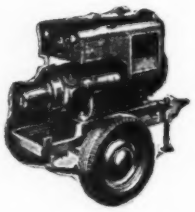

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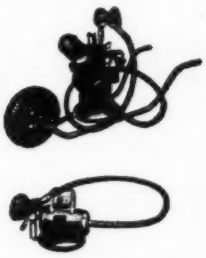

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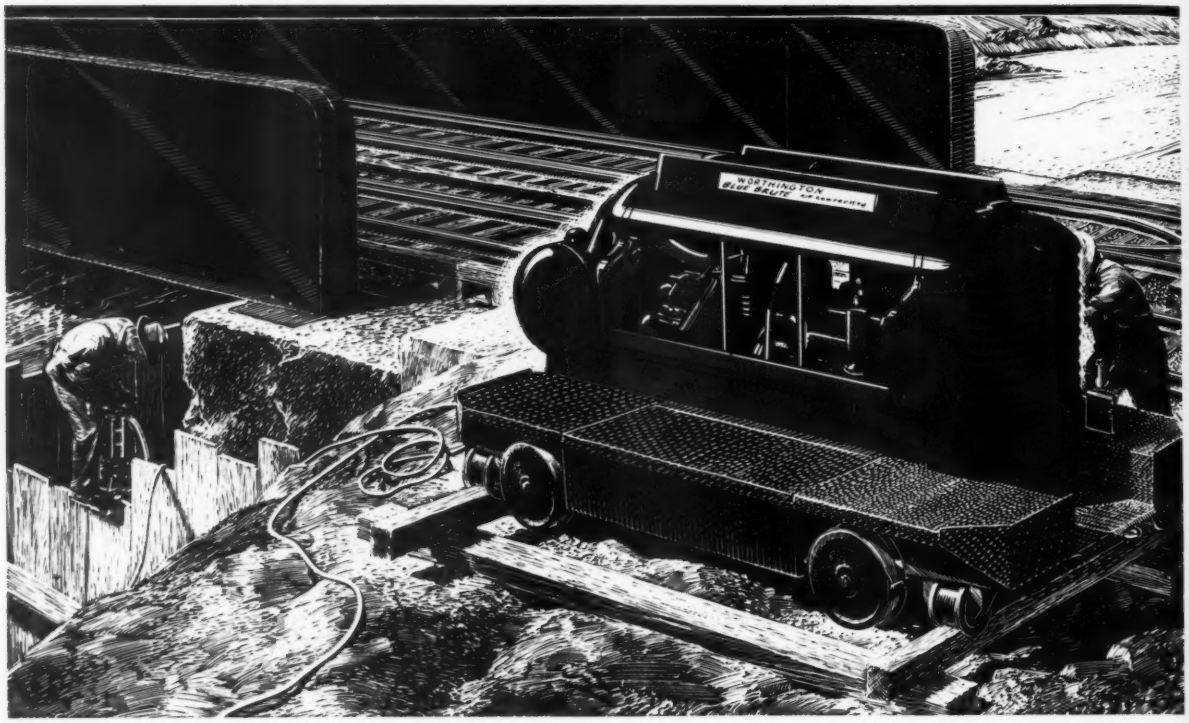
Heavily loaded freights and fast passenger trains are pounding tracks incessantly.

Under this continuous traffic the task of proper track maintenance is terrific.

Improved Hipowers are exceptionally helpful in this essential job.

THE NATIONAL LOCK WASHER COMPANY, NEWARK, 5, N. J., U. S. A.

RIGHT... ON THE RIGHT OF WAY



Emergencies are short-lived when you tackle them with Blue Brutes. For example, at driving sheeting clean and fast around flood-weakened supports, nothing can beat these two star performers on the Worthington Track Team.

The Blue Brute Rail Car Compressor moves up on the rails and then easily off to one side, on a simple rig of skids and transverse wheels. Then you've got an unfailing source of power for as long as you want it . . . thanks to Worthington's easy-breathing Feather* Valves, three-point suspension of engine and compressor in a single housing, and full force-feed lubrication.

Hooked up to Blue Brute WSD-81 Sheeting Drivers, this two-fisted air-supply delivers fast, hard blows that get your sheeting down in record time, under all conditions.

There are Blue Brutes for greater speed and economy on every type of job. Rock Drills and Air Tools, portable gasoline or Diesel Compressors . . . champions all, at making less air do more work . . . each one ready to prove to you that *there's more worth in Worthington.*

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H6-10

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